A COMBINED-NETWORK APPROACH FOR COMPILATION, EVALUATION, AND ANALYSIS OF PRECIPITATION-CHEMISTRY DATA FOR THE UPPER OHIO RIVER VALLEY AND LOWER GREAT LAKES REGION, 1976-85

By Donna N. Myers

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CONVERSION FACTORS AND ABBREVIATIONS

Multiply	By	To obtain
centimeter (cm)	0.3937	inch
meter (m)	3.281	foot
square meter (m^2)	10.76	square foot
milliliter (mL)	0.06101	cubic inch
liter (L)	0.2642	gallon
milliliter (mL)	0.06101	cubic inch
gram (g)	0.03527	ounce

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ABSTRACT

Precipitation in the upper Ohio River Valley and lower Great Lakes States is among the most acidic in the Nation. Recent studies based on data from a limited number of sites from single precipitation-chemistry data-collection networks have indicated possible declines in the acidity of precipitation in the upper Ohio River Valley and lower Great Lakes region. An investigation was done to determine whether similar patterns and changes in precipitation chemistry could be found for sites combined from several precipitation-chemistry data-collection networks including networks for which this type analysis has not been done.

Thirteen independent precipitation-chemistry data-collection networks were evaluated for possible inclusion in a combined data base. Networks were evaluated by use of five criteria before data were accepted for statistical analysis. These criteria included availability of data in the ADS (Acid Deposition System) data base, documentation and use of quality-assurance and quality-control practices, use of documented and accepted field and laboratory methods and practices, defined site-location characteristics, and analysis for a common set of precipitation-chemistry constituents. Seven networks with sites in Ohio, Indiana, Kentucky, Michigan, New York, Pennsylvania, West Virginia, and Ontario, Canada, were selected for analysis. Areal and temporal patterns in pH and concentrations of hydrogen ion, sulfate, nitrate, chloride, ammonium, sodium, potassium, calcium, and magnesium in precipitation were determined.

A total of 70 sites from 7 networks for which a minimum of 1 year of data was available were selected for computing precipitation-adjusted average pH and ion concentrations and for mapping these areal patterns. Fifty-four sites for which a minimum of 3 years of data were available were selected for computing the average quantity of an ion deposited at a site (ion deposition) and for mapping these areal patterns. Ion-concentration and ion-deposition patterns were similar for the most common inorganic ions in precipitation (sulfate, nitrate, ammonium, and calcium). Precipitation chemistry at sites in eastern Ohio, Pennsylvania, western New York, and southern Ontario was characterized by the highest ion concentrations and ion deposition from rainfall in the region.

Relations among ion concentration, pH, and amount of precipitation and season were determined for 42 sites for which a minimum of 5 years of data from 1976 through 1985 were available. These relations were examined by use of linear-regression analysis. Ion concentrations in rainfall for each month were inversely related to the amount of precipitation in the same month. Therefore, ion concentrations were greater in months that received less than average amounts of precipitation than in months that received greater than average amounts of precipitation. The inverse relation between ion concentration and amount of precipitation was strongest for, in descending order, nitrate, sulfate, and calcium, compared to pH, chloride, ammonium, sodium, potassium and magnesium. Seasonal variations in pH and ion concentrations were found for most of the sites investigated. The highest concentrations of sulfate, nitrate, ammonium, calcium, and magnesium in precipitation occurred near the middle of the year (May through August), whereas the highest pH values (lowest acidity) and highest concentrations of sodium and chloride occurred early in the year (January and February).

The Seasonal Kendall test was used to detect year-to-year changes in monthly mean ion concentrations and residuals from the regressions relating ion concentration and pH to amount of precipitation. Temporal trends were determined for 42 sites for which a minimum of 5 years of data, collected during the period 1976 through 1985, were available. Trend tests for ion concentrations were done to determine year-to-year changes in precipitation-chemistry data. Trend tests for regression residuals were done to determine year-to-year changes in precipitation-chemistry data after adjustment for the effects of amount of precipitation. In this way, the reciprocal effects of amount of precipitation on ion concentrations can be factored out. Overall, many more downtrends (declines) than uptrends (increases) were found in ion concentrations. Of a total of 378 tests on ion concentrations (9 ions at each of the 42 sites), 23.3 percent indicated downtrends at $\alpha=0.05$. Of a total of 222 trend tests on regression residuals, 19.4 percent indicated downtrends at $\alpha=0.05$. Downtrends in ion concentrations and regression residuals indicate a general reduction in the concentration of dissolved anions and cations in precipitation at those data-collection sites. Downtrends for sulfate ion were detected more than for any other ion. Downtrends in sulfate ion were detected at 47.6 percent of all sites tested and in regression residuals at 43.8 percent of sites tested. Downtrends also were detected for sodium, calcium, chloride, and potassium concentrations at 26 to 38 percent of all sites tested and in regression residuals at 10 to 35 percent of all sites tested. Uptrends in nitrate concentrations and nitrate regression residuals were detected at only one data-collection site. Uptrends in pH and pH regression residuals were detected at eight and four sites, respectively. No trend was detected most frequently for nitrate and ammonium compared to other ions. Graphical representations of sulfate and nitrate concentrations and their regression residuals over time corroborate the results of trend tests that show downtrends for sulfate ion and lack of any trends at most sites for nitrate ion.

This study demonstrates that precipitation-chemistry data collected by different organizations having different data-collection objectives can be aggregated and statistically evaluated to determine regional and temporal patterns in precipitation chemistry. The use of a combined network approach resulted in analysis of more sites in a greater variety of land-use and emission conditions than would be possible with data available from only one or two networks.

The combined-network approach corroborates previous studies by other authors of areal and temporal patterns of precipitation chemistry. Compared with other studies of precipitation-chemistry data for similar time periods during 1978-83 and 1978-84, a similar number of downtrends as a percentage of the total number of sites for which a trend was tested were noted for sulfate, sodium, calcium, and chloride concentrations and their regression residuals. The largest difference in the results of this study as compared with results of similar studies was the absence in this study of detectable downtrends at 41 of 42 sites for nitrate concentrations and regression residuals.

The slightly longer period of record used in this study as compared to those of previous studies may be a factor contributing to the difference in results of nitrate trend tests. Graphical presentation of nitrate concentrations over time indicate, for 31 of 42 sites, a downtrend in concentrations and residuals from the late 1970's through 1982 and an uptrend from 1983 through 1985. This pattern is consistent with decreases in emissions of nitrogen oxides from the late 1970's through the early 1980's, which were followed by slight increases after 1983. Graphical presentations of sulfate concentrations and regression residuals support the trend-test results and are coincidental with a reported 20- to 25-percent decline in sulfate emissions from 1975 through 1985.

INTRODUCTION

Precipitation in the Ohio River Valley and lower Great Lakes States is among the most acidic in the Nation (Albritton and others, 1987). Precipitation chemistry in this region has been characterized by an annual average pH of 4.2 and by elevated concentrations and deposition of sulfate and nitrate (Peters and Bonelli, 1982; Barrie and Hales, 1984; Barchet, 1987). Studies in the mid-1980's determined that concentrations of sulfate and those of other ions in precipitation could have decreased during 1976-85 in Ohio and in the eastern United States (Schertz and Hirsch, 1985; Dana and Easter, 1987; Barchet, 1987). Concurrently, Albritton and others (1987) reported a 21-percent decrease in sulfate emissions in Ohio and neighboring States during 1976-85.

Most investigators have used data from one or two precipitation-chemistry data-collection networks to describe areal and temporal patterns (Schertz and Hirsch, 1985; Barrie and Hales, 1984; Dana and Easter, 1987). Typically, sites within such networks are more than 50 miles from each other or may be restricted geographically to a region or State. Individual networks contain a relatively small number of sites that can be tested for changes in precipitation chemistry over time. An approach in which data from many precipitation-chemistry data-collection networks were used would result in a "combined network" of sites located closer together and would include a broader range of land-use and emission conditions than would be possible in any single network. Agreement between networks with regard to temporal and areal patterns of ion concentrations would provide a strong argument in support of previous findings that indicate a decline in the concentrations of some dissolved inorganic substances in precipitation since the late 1970's.

A number of national and regional precipitation-chemistry data-collection networks in the eastern United States and Canada include sites in the upper Ohio River Valley and lower Great Lakes region for which a combined-network approach can be used. Although the precipitation-chemistry data-collection networks operate independently and have different operating characteristics and program goals, they have the common objective of collection and analysis precipitation samples. Combining data from several networks can increase the number of sites available for analysis.

The approach of combining data from independent networks is not new. Data combined from two to three networks have been used in several studies to evaluate the precipitation chemistry of northeastern North America and the Great Lakes region (Strensland and others, 1986; Gatz and others, 1987) as well as the quality of the rivers of the United States (Smith and others, 1987). Only Barchet (1987) has used a combined network comprised of sites from more than three networks for analysis of precipitation-chemistry data. In addition, techniques for comparing data programs have been developed to take technical and programmatic factors into consideration (Hren and others, 1987; Childress and others, 1989). The study reported herein is an analysis of data combined from seven precipitation-chemistry data-collection networks. The study was done by the U.S. Geological Survey in cooperation with the Ohio Air Quality Development Authority.

Purpose and Scope

The purpose of this report is to characterize the areal, seasonal, and year-to-year changes in the chemical composition of precipitation with reference to nine major ions and two physical properties. The major inorganic-chemical constituents and related physical properties and characteristics of precipitation are pH, hydrogen ion, sulfate, nitrate, chloride, ammonium, sodium, potassium, calcium, magnesium, and amount of precipitation. A detailed analysis of the areal and temporal patterns of precipitation chemistry in the upper Ohio River Valley and lower Great Lakes region was undertaken by use of a combination of data. The data, which span the period 1976-85, were selected from several independent precipitation-chemistry data-collection networks. Precipitation chemistry is characterized for Ohio, Indiana, Kentucky, lower Michigan, New York, Pennsylvania, West Virginia, and southern Ontario, Canada.

Acknowledgments

Precipitation-chemistry data were obtained from the Acid Deposition System data base, operated by Battelle Pacific Northwest Laboratory and funded as part of the National Acid Precipitation Assessment Program. The author would like to thank the Ohio Environmental Protection Agency for technical assistance and editorial review of the report.

THE COMBINED-NETWORK APPROACH

The formulation of a combined network for analysis of precipitation-chemistry data should account for similarities as well as differences among the component networks. Characteristics such as frequency of sample collection, methods of sample collection and analysis, and quality assurance of the data must be considered before data from independent precipitation-chemistry data-collection networks are combined.

Evaluation of Networks and Their Operating Characteristics for Describing Precipitation Chemistry

At the beginning of this study, 13 independent precipitation-chemistry data-collection networks (table 1) with a total of 114 unique sites (fig. 1) were identified in the study area. Of the 114 sites, only 110 are in figure 1 because 4 sites are colocated with other sites. Characteristics of each of these 13 networks were evaluated on the basis of five selection criteria (discussed in the next section of the report) to construct the combined data base. Information needed to determine whether these five criteria were being met by the selected networks was obtained from telephone interviews with representatives of each network or from network documents.

Table 1.--Operating characteristics of precipitation-chemistry data-collection networks active in the study area from 1976 through 1985

[<, less than; USEPA, U.S. Environmental Protection Agency]

Network[1]	Period of operation	Number of sites in study area	Sampling frequency	Length of record of sites (years)		
				1 to <3	3 to <5	5 or more
National Atmospheric Deposition Program/ National Trends Network (NADP/NTN)[1]	1978 through present	28	Weekly	11	1	16
MAP3S Precipitation Chemistry Network (MAP3S)	1976 through present	5	Event	0	0	5
Canadian Air and Precipitation Monitoring Network (CAPMoN)	July 1983 through present	4	Daily	3	1	0
Canadian Network for Sampling Precipitation (CANSAP)	1973 through 1986	6	Monthly	0	1	5
Canadian Air and Precipitation Monitoring Network (APN)	November 1978 through February 1985	1	Daily	0	1	0
Acidic Precipitation in Ontario Study Cumulative Network (APIOS-C)	July 1980 through present	16	28-day composited	2	1	13
Acidic Precipitation in Ontario Study Daily Network (APIOS-D)	July 1980 through present	10	Daily	10	4	6
Utility Acid Precipitation Study Program (UAPSP and EPRI/SURE)	August 1976 through present	9	Daily	1	4	4
Tennessee Valley Authority (TVA)	1978 through present	6	Biweekly	5	0	1
Region III USEPA	1984 through present	4	Weekly	4	0	0
Region IV USEPA	1982 through present	1	Weekly	0	1	0
Great Lakes Atmospheric Deposition Program (GLAD) Region V USEPA	1981 through present	24	Weekly to biweekly	5	19	0
Total		114				

[1]NADP/NTN are considered to be two networks.

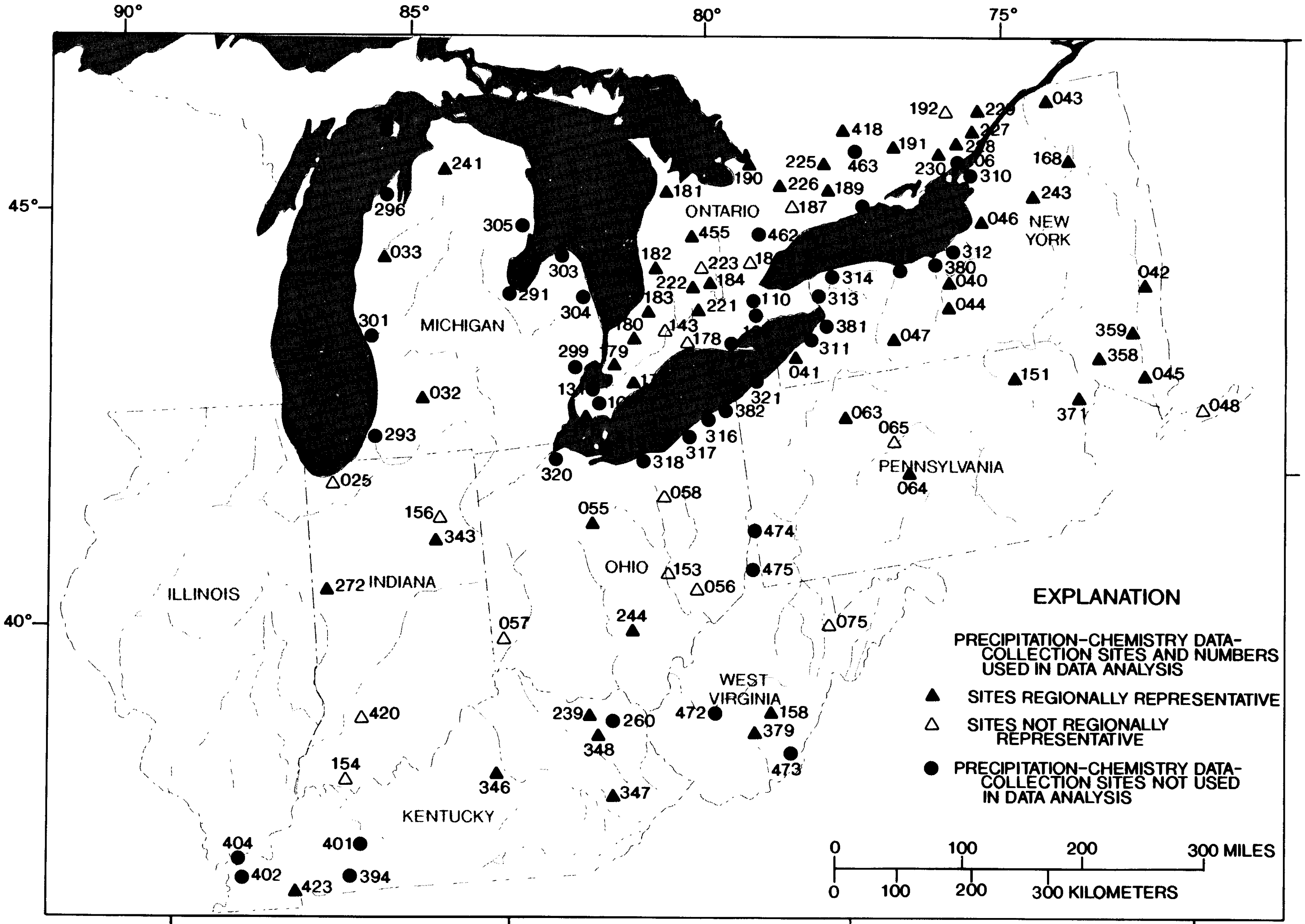


Figure 1.--Location of precipitation-chemistry data-collection sites active in the study area from 1975 through 1985

Selection Criteria

Before data were combined for statistical analysis, all of the 13 networks were screened with reference to five selection criteria--

1. Availability of data in the ADS (Acid Deposition System).
2. Characterization of site locations.
3. Analysis for a common set of properties and constituents.
4. Use of documented and accepted field and laboratory methods and practices.
5. Adequate and documented quality-assurance and quality-control practices.

Results of the screening are summarized in table 2.

Availability of Data in the Acid Deposition System

The ADS was the source for all computerized data used in this study because it provides a common format for all networks. The ADS is a data base containing extensive information on many of the North America's precipitation-chemistry data-collection networks.

Of the 13 networks considered, 12 reported having fully computerized data bases. Precipitation-chemistry data from 4 of the 13 networks are not available from the ADS (table 2), thus, these four networks were eliminated from the data analysis. Precipitation-chemistry data for nine networks with sites in the study area were obtained from the ADS.

Characterization of Site Locations

The local and regional environments surrounding precipitation-chemistry sample-collection sites can influence chemical composition of the samples. For example, precipitation in urban areas can contain higher concentrations of trace metals, sulfate, nitrate, and calcium than does precipitation in rural or remote areas that typify regional precipitation chemistry (Schroder and others, 1987; Barchet, 1987). Furthermore, precipitation-chemistry sample-collection sites adjacent to local sources of contaminants, such as dusty roads or local emission sources, could also represent those local conditions rather than regional precipitation chemistry. Therefore, it is important to define the site-location characteristics before data are considered for statistical analysis and interpretation.

Table 2.--Summary of criteria used to evaluate precipitation-chemistry data-collection networks for inclusion in a combined-data base

[NA, information not available]

Network[2]	Data available in ADS	Site location characteristics: Regional	Nonregional	Unranked	Total	Adequate and documented quality assurance and quality control practices	Use of documented and accepted field and laboratory methods and practices	Additional properties and constituents measured[3]
NADP and NTN[1]	Yes	25	3	0	28	Yes	Yes	Specific conductance and phosphate
MAP3S[1]	Yes	5	0	0	5	Yes	Yes	Specific conductance, phosphate, and nitrite
CAPMoN[1]	Yes	3	1	0	4	Yes	Yes	Specific conductance, phosphate, acidity, and alkalinity
CANSAP	Yes	0	6	0	6	No	NA	Specific conductance
APN	Yes	0	1	0	1	No	NA	Total phosphorus
APIOS-C[1]	Yes	14	2	0	16	Yes	Yes	Total kjeldahl nitrogen, total phosphorus, aluminum, cadmium, copper, iron, lead, nickel, maganese, and vanadium
APIOS-D[1]	Yes	10	0	0	10	Yes	Yes	Specific conductance and total acidity
UAPSP[1]	Yes	6	3	0	9	Yes	Yes	Specific conductance, phosphate, acidity, and alkalinity
TVA	No	1	2	3	6	Yes	Yes	Specific conductance
REGION-III	No	0	4	0	4	Yes	Yes	Specific conductance, acidity, and alkalinity
REGION-IV	No	0	1	0	1	Yes	Yes	Specific conductance and acidity
GLAD	No	9	11	4	24	Yes	Yes	Specific conductance, orthosphosphate, total phosphorus, total kjeldahl-nitrogen, aluminum, arsenic, cadmium, copper, chromium, lead, nickel, manganese, mercury, vanadium, zinc, and selenium
Total sites		73	34	7	114	--	--	
Number of sites accepted for use		63	16	0	79			

[1]Data from these networks were used in the statistical analyses.

[2]NADP/NTN are considered to be two networks.

[3]Ten common physical properties and chemical constituents are pH (hydrogen ion), sulfate, nitrate, chloride, ammonium, sodium, potassium, calcium, and magnesium.

For this study, the ADS criteria for characterizing the local and regional environment of sample collectors was used to classify potential sites (Olsen and others, 1986). Sites that meet all or most of the ADS criteria (many rural and remote sites) are considered representative or potentially representative of regional precipitation chemistry, whereas sites that fail to meet most of the criteria (many urban sites) are considered potentially unrepresentative or unrepresentative of regional precipitation chemistry. Many sites classified as regionally unrepresentative according to ADS criteria are within a short distance of urban areas or major emission sources. The U.S. Environmental Protection Agency (USEPA) has developed a set of similar siting criteria. The criteria for USEPA's "urban sites" depart from ADS regional criteria in that certain requirements for distance from local emission sources are relaxed and recommendations specific to site-location characteristics of urban precipitation collectors are added (Tew and Eaton, 1986).

Documentation of site-location characteristics was required +htor any site to be included in this analysis. Regardless of whether a site was regionally representative or unrepresentative, the precipitation-chemistry data were accepted for the purposes of this report if site-location characteristics were defined. The study area contains 73 sites determined to be, or potentially to be, regionally representative and 34 sites determined to be, or !potentially to be, regionally unrepresentative (fig. 1). Seven sites could not be classified because of incomplete information, and these sites were not used in the data analysis.

Analysis for a Common Set of Properties and Constituents

Data on a common set of nine ions plus pH and amount of precipitation were reported by all the networks considered for inclusion in this study. The nine ions were hydrogen, sulfate, nitrate, chloride, ammonium, sodium, potassium, calcium, and magnesium. All concentration values are reported in ion form. Therefore, nitrate values are expressed as nitrate ion rather than as nitrate-nitrogen. In addition, several networks reported data on alkalinity, acidity, specific conductance, selected trace metals, organic nitrogen, and total and dissolved phosphorus (table 2), but these data were not used in the statistical analyses.

Use of Documented and Accepted Field and Laboratory Methods and Practices

Precipitation-chemistry data-collection networks typically maintain a standard set of equipment, including precipitation-chemistry sample-collectors, adapters for snow collection or special snow collectors, and rain gages. A variety of sample-collection frequencies were reported by the networks (daily, weekly, cumulative monthly, event; table 1). This variety of sample-collection frequencies resulted in use of different types of collectors among the networks. However, collectors reported by the networks whose data was accepted for use in this study consisted of some type of wet collector, which is opened during precipitation events and closed during dry weather. No data from samples collected in bulk- or dry-deposition collectors were used in this study to characterize precipitation chemistry.

Ten of the thirteen networks reported having rain gages at each site for the measurement of precipitation quantity. Rain-gage types differed from network to network depending on the frequency and type of sample collection. Three Canadian networks and several networks in the United States reported that their sites were equipped or modified with snow collectors. No information on field equipment was obtained for two networks, and data from these two networks were not used for the statistical analysis.

Information on methods of chemical analysis were available for 11 of the 13 precipitation-chemistry data-collection networks (table 2). The laboratory methods used to analyze the nine chemical constituents and pH were compared to determine whether the methods were equivalent (that is, whether the same chemical constituent or physical property was measured). For example, total acidity can be determined by two commonly used methods, but results obtained by the Gran titration will differ from results obtained by a fixed-endpoint titration. The latter method may not measure all of the acidity present in the sample. Methods reported by the networks were also compared to those recommended by the USEPA (Peden and others, 1986). Data used in this study were produced by use of methods that were equivalent and recommended by the USEPA.

Either ion chromatography or automated colorimetry was used by 11 networks including the 7 networks whose data was used in this study for analysis of sulfate, nitrate, ammonium, and chloride in precipitation samples. The methods reported by these 11 networks are equivalent and are among those recommended by the USEPA (Peden and others, 1986). Comparative studies completed by two networks that changed from automated colorimetry to ion chromatography demonstrated acceptable comparability between methods (Peden and others, 1986).

Use of flame atomic absorption (FAA) or inductively coupled plasma emmission (ICP) spectrometry was reported by 11 networks for determination of sodium, potassium, calcium, and magnesium concentrations. Comparative testing within one laboratory that changed methods demonstrated that FAA and ICP yield comparable results for precipitation samples. Because FAA and ICP are among the recommended methods of the USEPA (Peden and others, 1986), data obtained by use of these methods were accepted for the purposes of this study. One network reported use of flame photometry (FP) for the determination of potassium concentration. No studies comparing the use of FP to AAS or ICP for determination of potassium concentration were found; however, optimum concentration ranges for analysis of potassium in precipitation samples are similar for AAS and FP, and data obtained by use of FP were accepted for use in this study.

All precipitation-chemistry data-collection networks reported use of an electrometric method to determine pH. This method was the same as that recommended by the USEPA (Peden and others, 1986). Hydrogen ion concentration reported in ADS is calculated by taking the antilog of the negative laboratory pH.

Use of Adequate and Documented Quality-Assurance and Quality-Control Practices

For this report, quality assurance is defined as a program or set of practices that encompass all facets of data collection, laboratory analysis, and reporting to establish the reliability of results. Quality control is defined as the routine use of specific procedures or practices to define the level of quality and reliability of a specific analytical or measurement activity.

Quality-assurance program documents were received from 11 of 13 networks, including all 7 of the networks whose data was used in this study. Quality-assurance documentation was not available for two networks, and data from these networks were not used for analysis of precipitation chemistry. Comparisons of the quality-assurance programs of the 11 networks were based on documented quality-control practices for field and laboratory operation, inte[Btrlaboratory testing, and intralaboratory testing.

All 11 networks reported having active quality-assurance programs for field operations, including guidelines that address field practices, field quality control, timing of collection, containers to be used, preservatives, standard operating procedures for sample handling, instrumental analysis in the field, and site operation. Nine laboratories were identified from the quality-assurance program documents used in this study. All nine laboratories were contacted, and all reported having documented quality-assurance guidelines.

The use of interlaboratory testing (conducted by an outside, Independent source) was required at least annually for the purposes of this study and was reported by all nine laboratories. The most frequently cited interlaboratory sample-testing programs, in order, were the USEPA's performance audit program, the U.S. Geological Survey's Standard Reference Water Sample Program, and Environment Canada's Long-Range Transport interlaboratory program.

Intralaboratory testing (independent testing conducted from within the laboratory) also was required for this study and was cited in the quality-assurance plans of all nine laboratories. This type of testing was done at varying frequencies by each laboratory, at least annually, and it generally involved the use of independently prepared check samples or standard reference materials.

In addition, five specific quality-control procedures were selected as criteria to describe the quality-control programs of each laboratory investigated. These procedures include the use of instrument calibrations, precision and bias controls (replicate analyses and spiked or reference standards), blanks, and corrective-action procedures in the event of errors. An overall commitment to the use of these procedures at a frequency of 15 percent of the the total number of samples analyzed was selected as the minimum level of quality control needed. (A 15-percent level of effort is identified in the U.S. Geological Survey's quality-assurance manual (Friedman and Erdmann, 1982) as being desirable). All nine laboratories met the minimum 15-percent level of quality control through the use of each of the quality-control activities mentioned above for all the methods investigated.

Results of the Selection-Criteria Evaluation

Precipitation-chemistry data from seven networks met all five criteria previously identified and were selected for statistical analysis (table 2). The comparison and selection of networks on the basis of these 5 criteria resulted in the identification of 12 networks with fully computerized data, of which 9 had data available in the ADS system. A total of 6 of the 13 networks were dropped from the data-analysis part of this study. Two of the thirteen networks were dropped from the data analysis because of a lack of documented-quality assurance and quality-control practices (these two networks had data in ADS). Four other networks were eliminated from consideration because they had no data in ADS. In addition, two of the four did not have rain gages or did not report amount of precipitation.

The data from 7 networks that were accepted for use in this study are comprised of 73 sites that are considered to be representative or potentially representative of regional precipitation chemistry and 34 sites considered to be unrepresentative or potentially unrepresentative of regional precipitation chemistry.

The five criteria and the number of precipitation-chemistry data-collection networks that met the criteria are summarized in the following table.

Criteria	Number of networks meeting criteria
1. Availability of data in ADS	9
2. Characterization of site locations	13
3. Analyses for a common set of constituents	13
4. Use of documented and accepted field and laboratory methods and practices	11
5. Adequate and documented quality-assurance and quality-control programs	11

PRECIPITATION CHEMISTRY IN THE UPPER OHIO RIVER VALLEY AND LOWER GREAT LAKES REGION, 1976-85

For this report, record length is defined as the length of time samples have been collected continuously at a site and analyzed. The period of record for 70 percent of all sites was from 1980 through 1984. Data was available for all 70 sites in 1984 and for 66 sites in 1985.

Sites were divided among three categories of record length (table 1): sites with 1 to less than 3 years of data, sites [Awith 3 to less than 5 years of data, and sites with 5 or more years of data. For all sites used in the data analysis, the first 6 months of data was deleted to avoid possible errors resulting from startup procedures at the site. Therefore, 1977 was the earliest year for which data were included in the combined data base.

Three different periods of record were used in the statistical analysis of the data. A minimum of 1 year of data was required for the determination of areal patterns in precipitation-weighted concentrations of ions and pH. One year of precipitation-weighted ion concentration data was deemed sufficient to describe areal patterns in precipitation chemistry for this study because at least one annual cycle of precipitation and ion concentration would be accounted for. Record lengths at 70 sites from 7 networks accepted for data analysis were 1 or more years.

A minimum of 3 years of data was required for determination of areal patterns in ion deposition because the variability from year to year in the quantity of precipitation received at any site will have a large effect on the estimated ion deposition. Record lengths at 54 sites in the study area were 3 or more years.

A minimum of 5 years of data was chosen for the determination of trends and seasonal patterns in precipitation chemistry. Five years was considered the minimum because precipitation-chemistry data are characterized by seasonal and multiyear climatic variations (Peters and others, 1982; Barchet, 1987). Record lengths at 42 sites in the study area were 5 or more years.

Summary Statistics for Ion Concentration, pH, and Ion Deposition

Summary statistics developed for the physical and chemical data in this report consist of the mean, median, maximum, minimum, 25th and 75th percentiles, and 5th and 95th percentiles of the distribution of values for each site in the study area (See tables 13 and 14 in the "Supplemental Data" section at the back of the report.) Summary statistics for ion concentrations and pH were computed for 70 sites for which 1 or more years of data are available during the period 1976-85. Summary statistics for ion deposition were computed for 54 sites for which 3 or more years of data are available for during the period 1976-85. Summary statistics for ion deposition do not include pH.

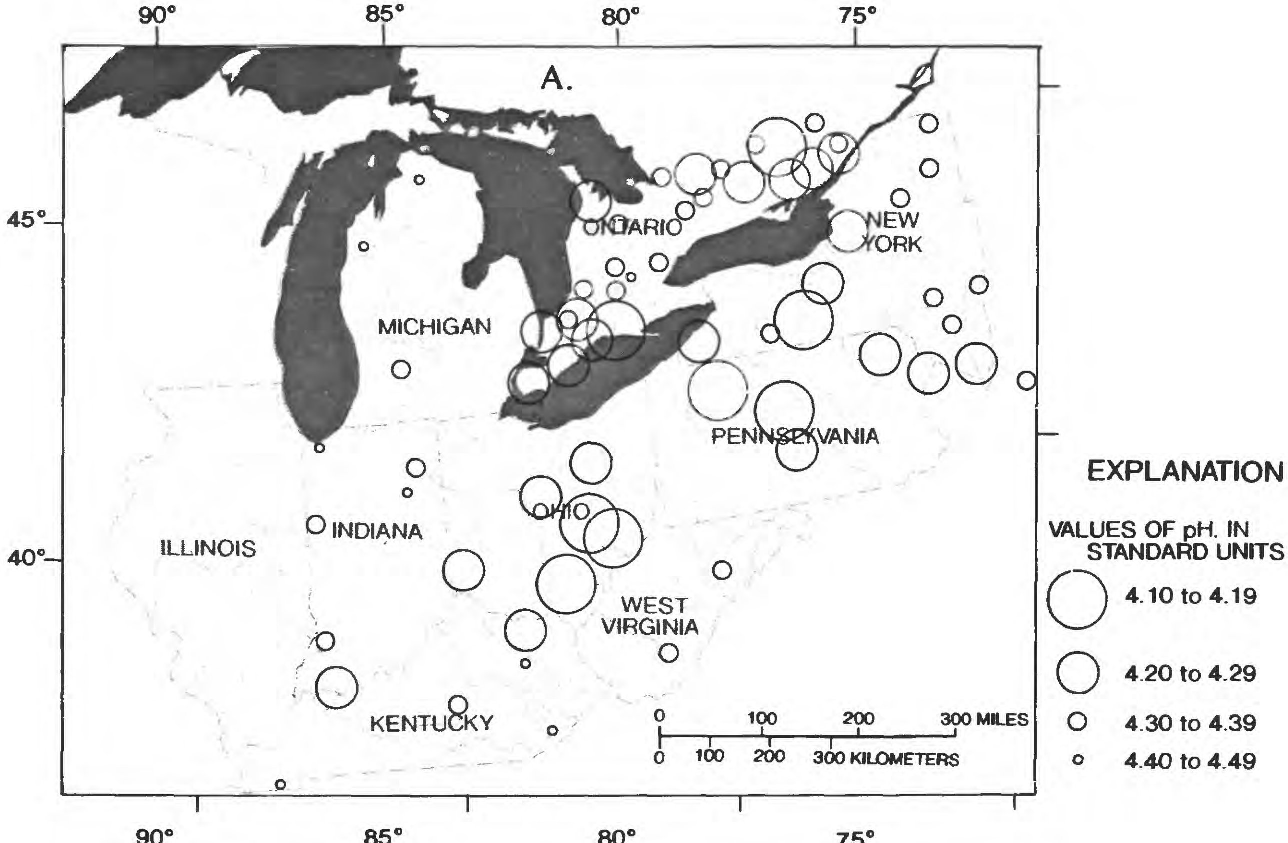
Summary statistics for ion concentrations and pH were computed at each site from precipitation-weighted monthly mean values (PWMM's) for the length of record of the site. The PWMM's were obtained directly from the ADS. PWMM's are calculated in the ADS by multiplying each sample value or concentration by the amount of precipitation (in centimeters), summing all values for the month, and dividing the sum by the total monthly amount of precipitation (Olsen and Slavich, 1986). The result is a value that is analogous to the concentration that would be measured had all samples been physically combined into a single container each month and chemically analyzed. Summary statistics for ion concentration are reported in milligrams or micrograms per liter and in standard units for pH. For networks that report detection limits, ion concentrations reported as below the detection limit are taken to be one-half the detection limit in the calculation of the means for each month in the ADS. Detection limits are not listed in the ADS summary file from which data was obtained for this study. The number of values that are below detection for each chemical constituent are reported separately and were used to calculate the percentage of ion-concentration values below the detection limit. One network did not use detection limits but reported all values from laboratory analyses, including small negative concentrations and small negative deposition values. The remaining six networks report detection limits. The percentage of ion concentrations below the detection limit was small, and it ranged from 0.2 percent for sulfate to 1.8 percent for magnesium. Therefore, this small number of concentrations below the detection limit should have a small effect on the statistical analysis of the data.

Ion-deposition values represent the total wet input of a chemical constituent from the atmosphere at each site. Monthly wet-deposition values, which were obtained directly from the ADS, are calculated as the sum of the products of each sample concentration, in milligrams per liter, and the amount of precipitation measured for that sample, in centimeters, for each month (Olsen and Slavich, 1986). Summary statistics for ion deposition were computed at each site from monthly values and are reported in milligrams per square meter for hydrogen ion and in grams per square meter for other ions. Monthly amount of precipitation was reported in centimeters. Multiplication of the mean of monthly ion-deposition values at a site by 12 yields an estimate of the annual average quantity of an ion delivered by rain to a site. Rounding by some networks resulted in the reporting of 0.0 for some ion-deposition values in table 14.

Sulfate was detected at higher concentrations than any other ion in precipitation samples from sites in the study area. Concentrations of sulfate were two to three times higher than concentrations of nitrate, which was the second most concentrated ion in precipitation samples in the study area. The predominant cations in precipitation samples were calcium and ammonium.

Areal Patterns in Precipitation Chemistry

Means of PWMM's for ion concentrations and pH were calculated for 70 sites, and means of monthly ion deposition were calculated for 54 sites. Mean PWMM pH and ion concentrations were calculated from PWMM's obtained from the ADS for the record length at each site and are represented by the mean concentration in the summary-statistics tables for ion concentrations and pH (table 13 at back of report). Maps of the mean PWMM ion concentrations and mean ion deposition for each constituent at each site (figs. 2-11) were constructed from the mean values listed in tables 13 and 14. Concentration ranges for mapping areal patterns in mean PWMM ion concentrations and mean ion deposition were chosen by evenly dividing the range of the means obtained for all sites in the study area into three to four smaller ranges.



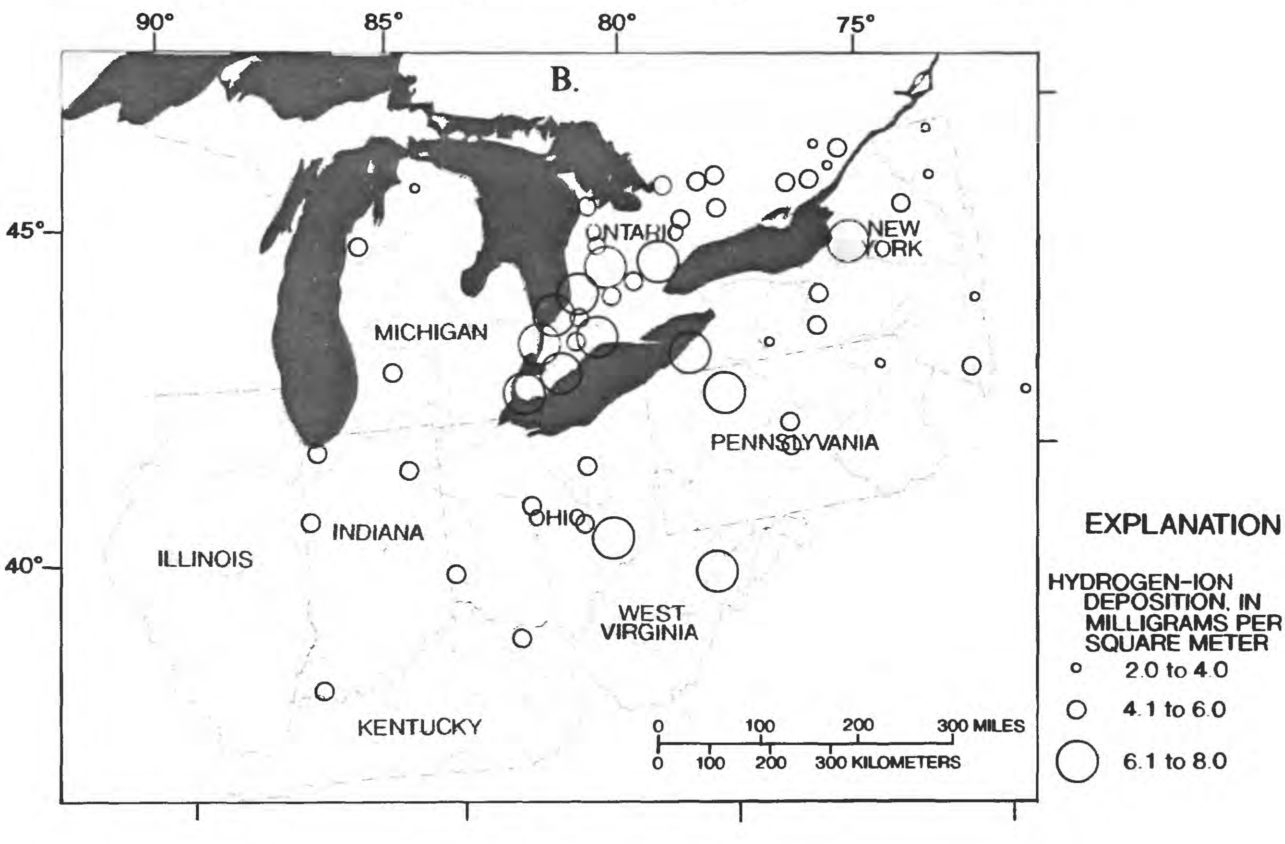


Figure 2.--Areal pattern in (A.) means of precipitation-weighted monthly mean pH and (B.) means of monthly hydrogen-ion deposition.

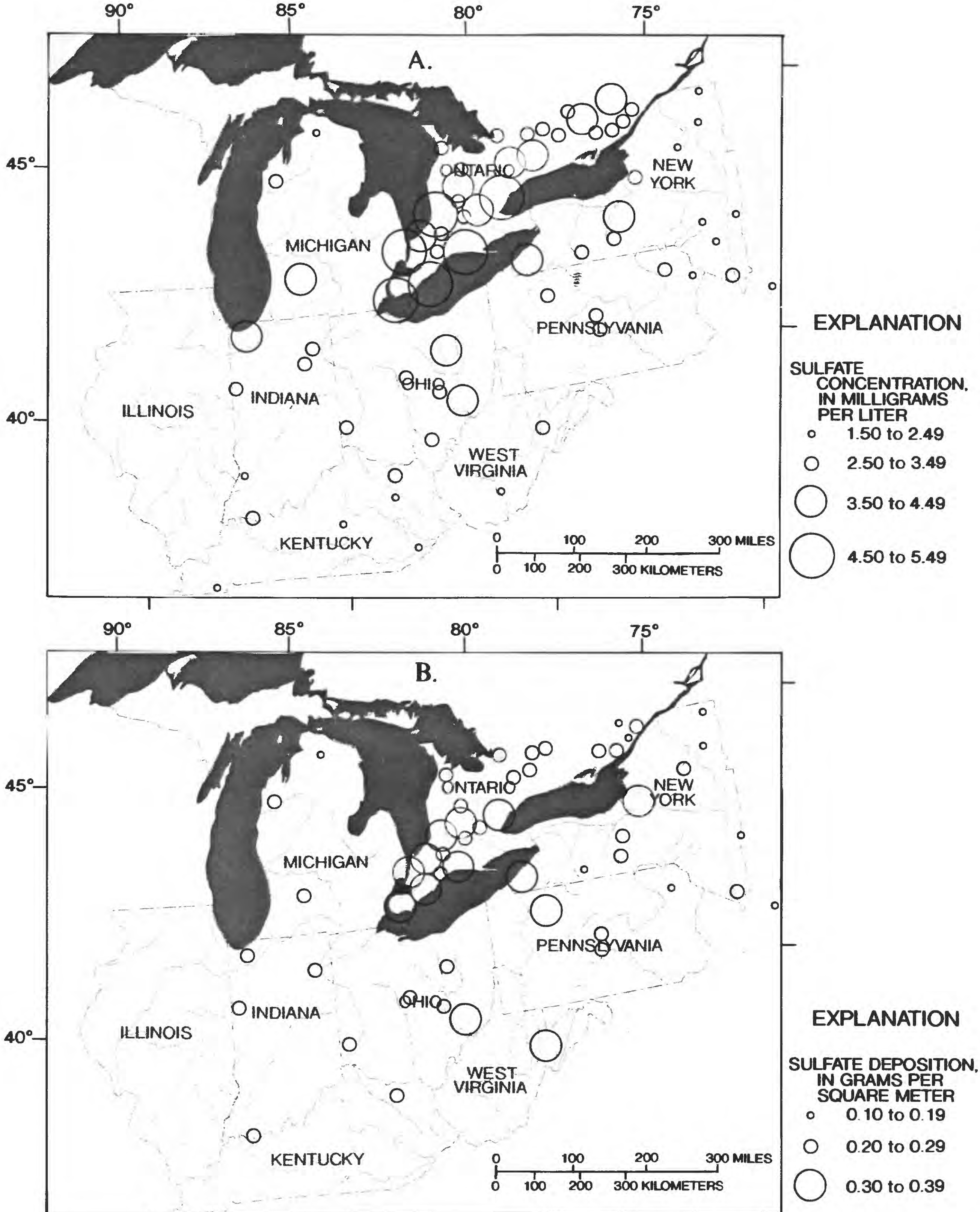


Figure 3.--Areal pattern in (A.) means of precipitation-weighted monthly mean sulfate concentration and (B.) means of monthly sulfate deposition.

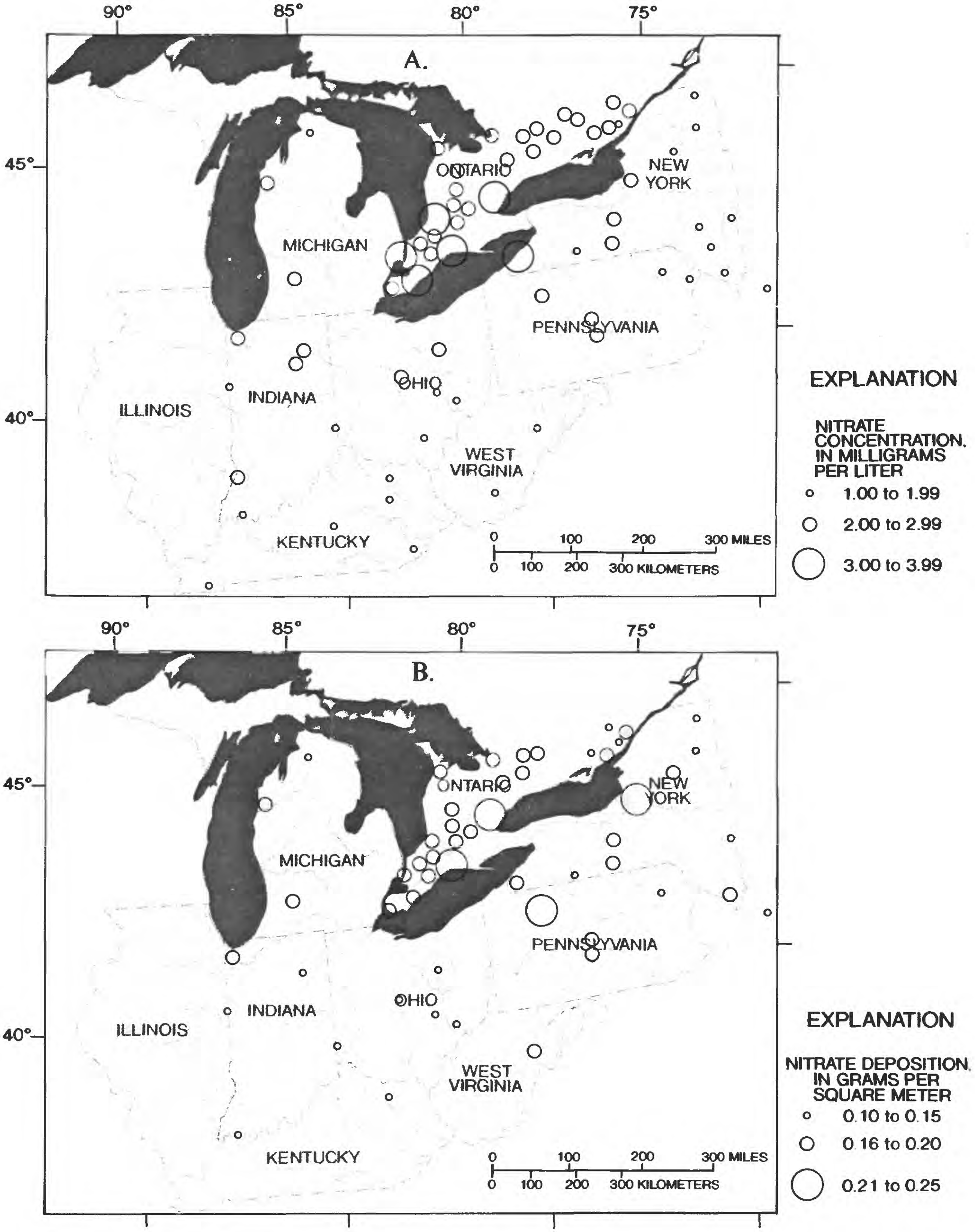


Figure 4.--Areal pattern in (A.) means of precipitation-weighted monthly mean nitrate concentration and (B.) means of monthly nitrate deposition.

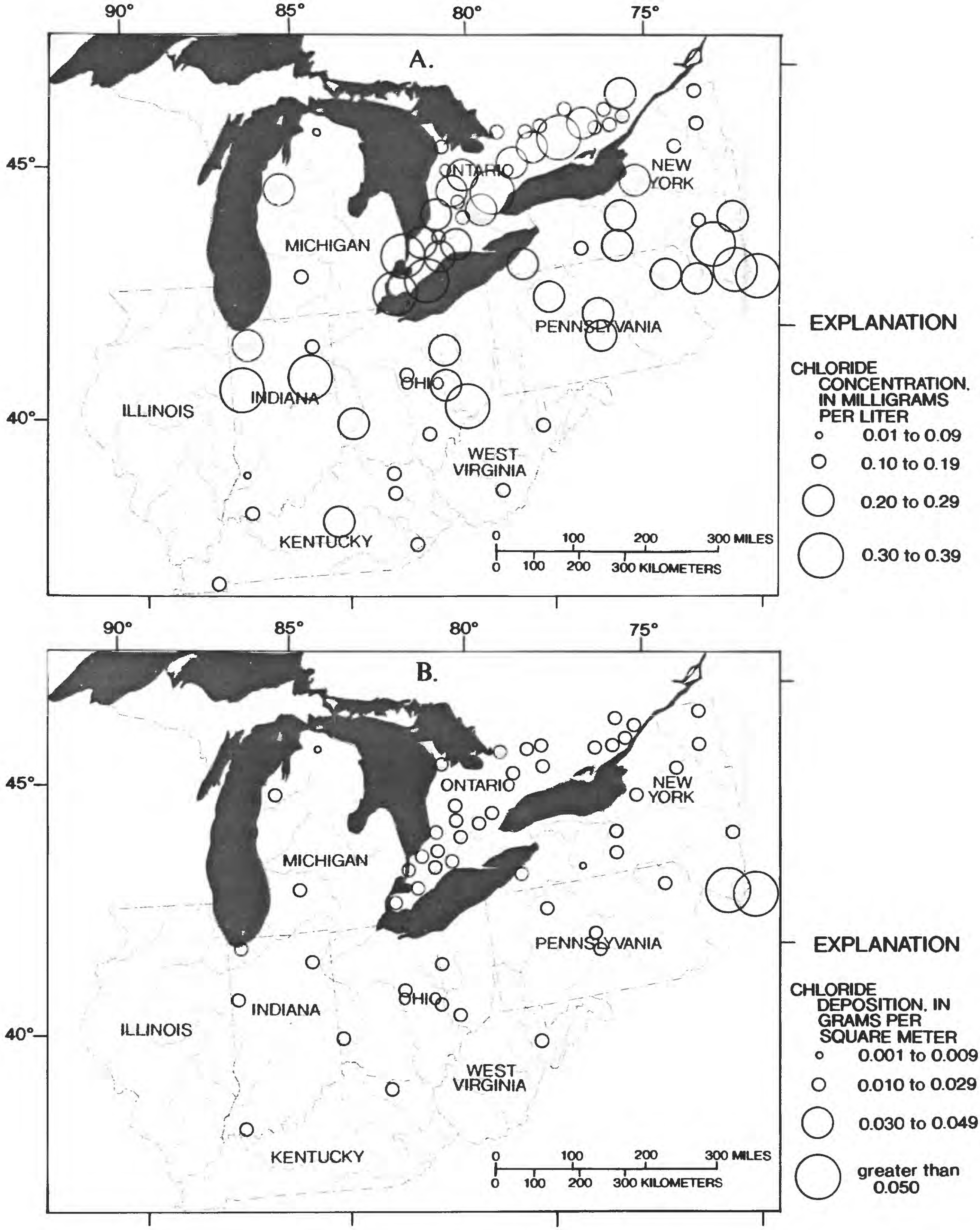


Figure 5.--Areal pattern in (A.) means of precipitation-weighted monthly mean chloride concentration and (B.) means of monthly chloride deposition.

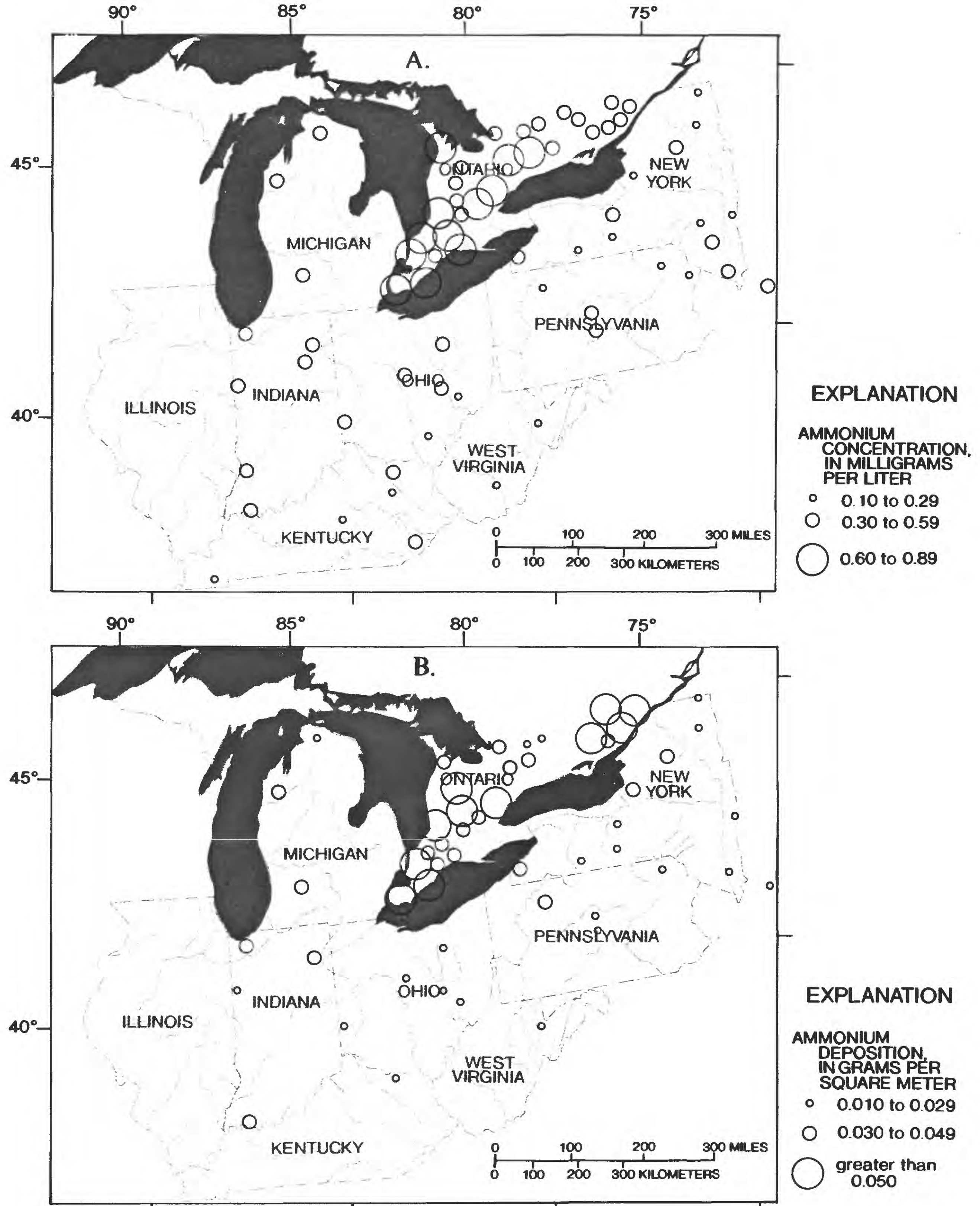


Figure 6.--Areal pattern in (A.) means of precipitation-weighted monthly mean ammonium concentration and (B.) means of monthly ammonium deposition.

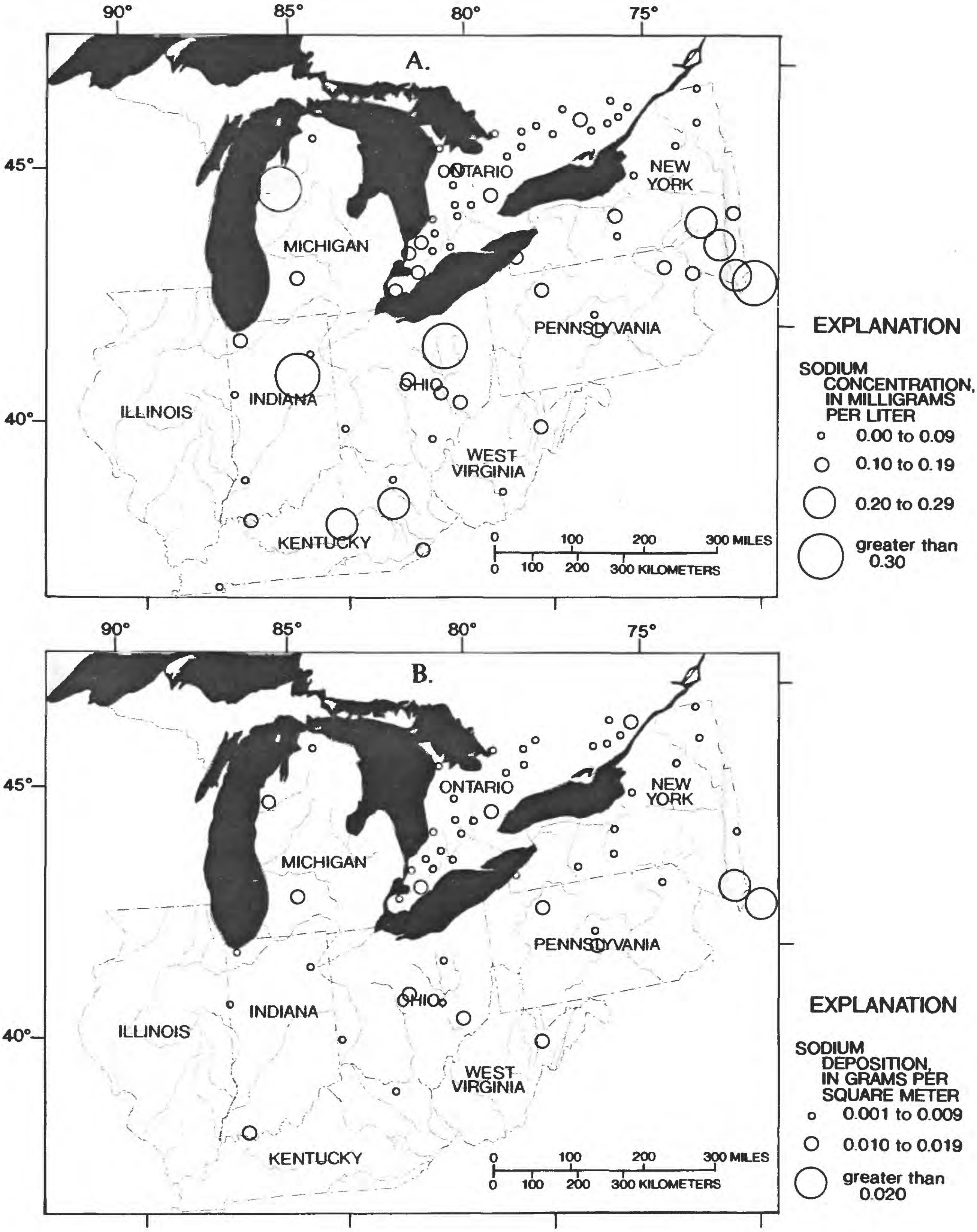


Figure 7.--Areal pattern in (A.) means of precipitation-weighted monthly mean sodium concentration and (B.) means of monthly sodium deposition.

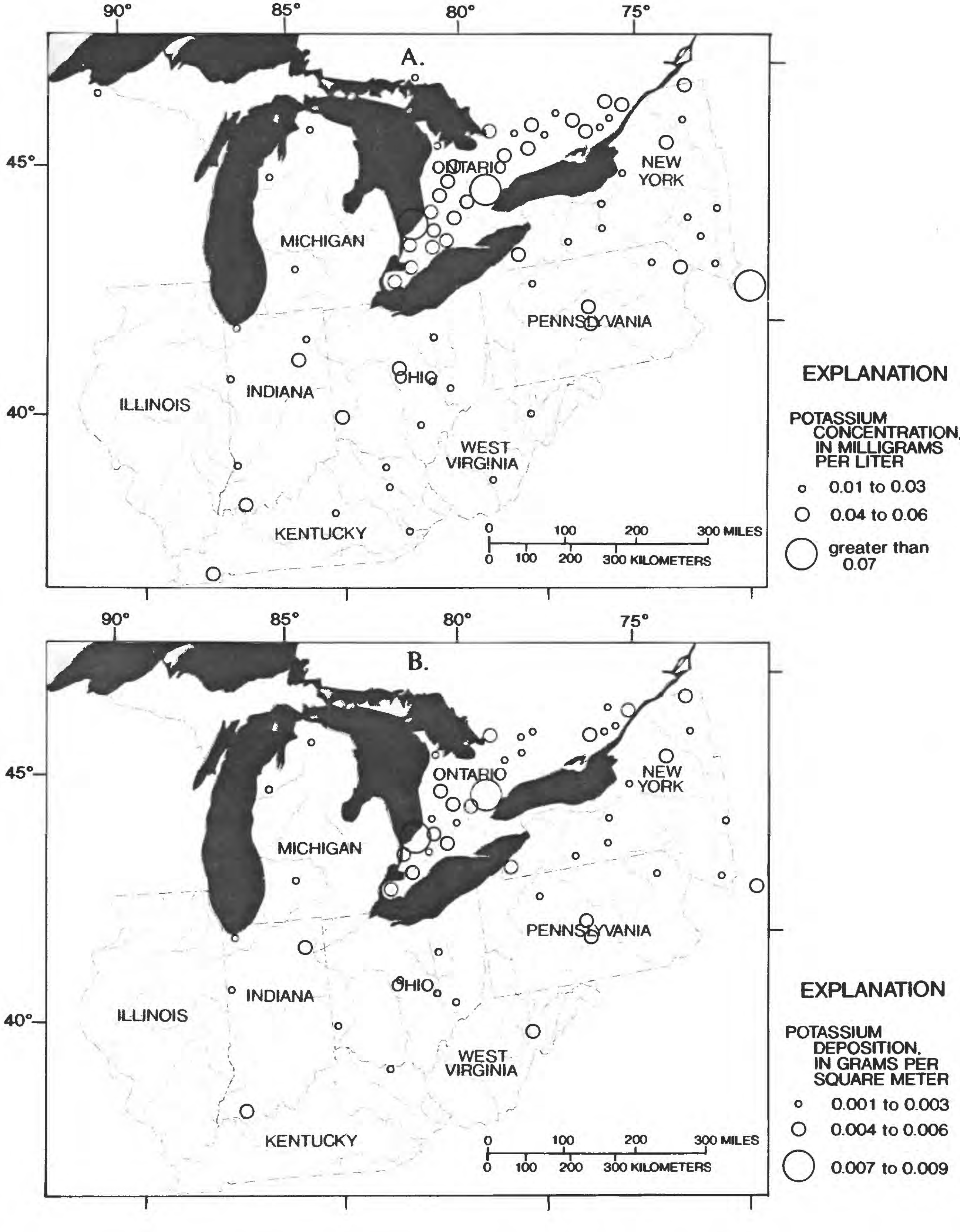


Figure 8.--Areal pattern in (A.) means of precipitation-weighted monthly mean potassium concentration and (B.) means of monthly potassium deposition.

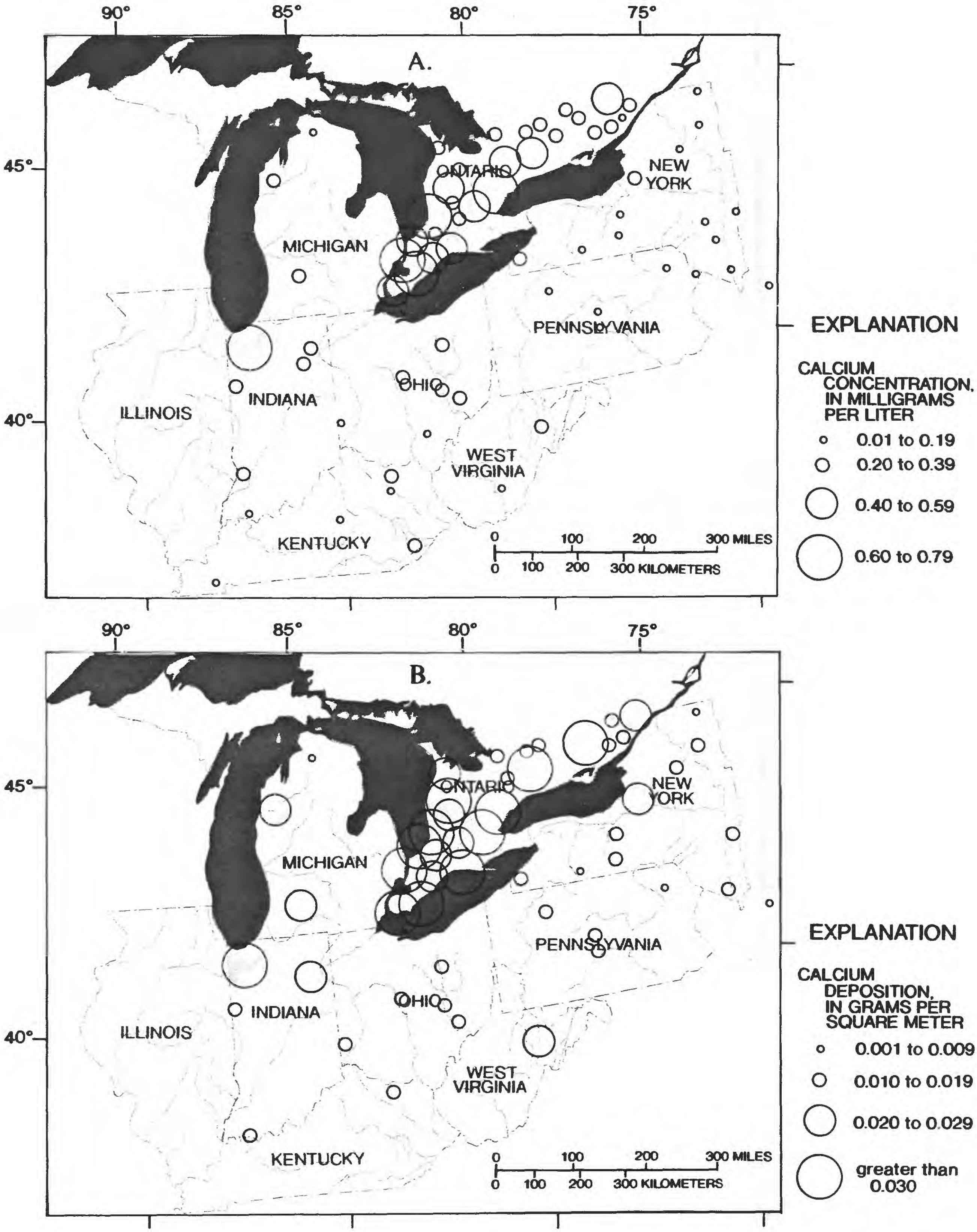


Figure 9.--Areal pattern in (A.) means of precipitation-weighted monthly mean calcium concentration and (B.) means of monthly calcium deposition.

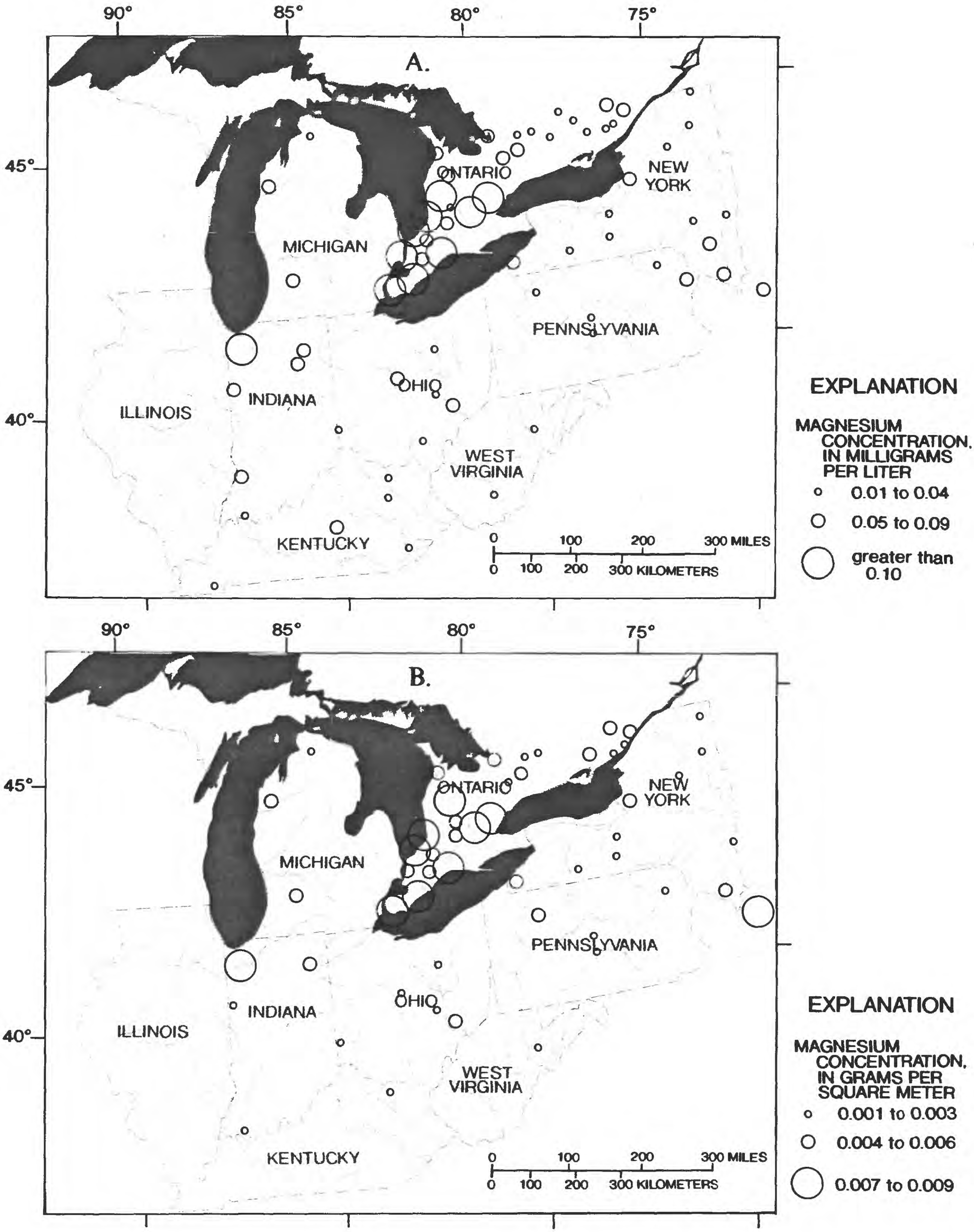


Figure 10.--Areal pattern in (A.) means of precipitation-weighted monthly mean magnesium concentration and (B.) means of monthly magnesium deposition.

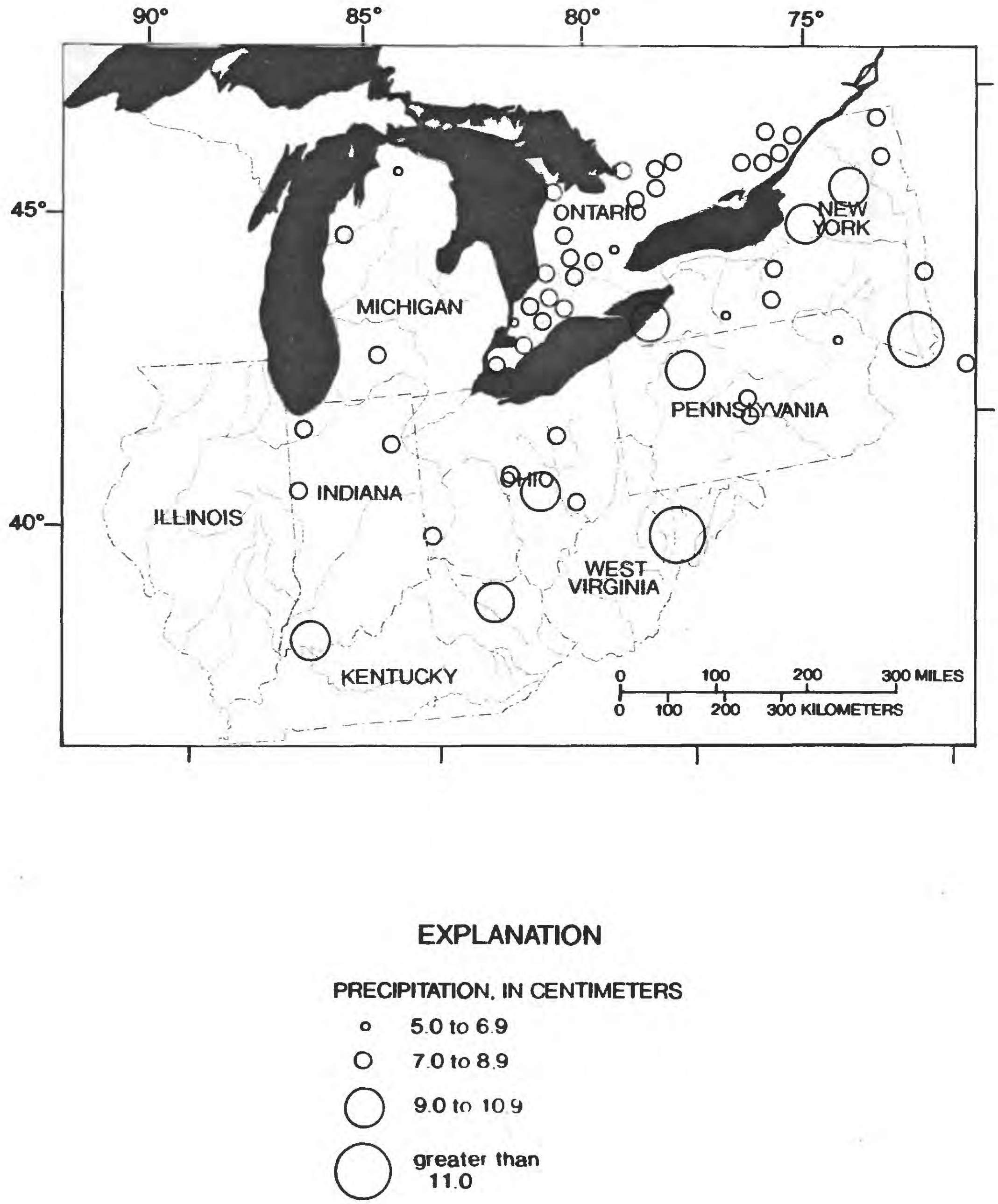


Figure 11.--Areal pattern in means of monthly precipitation amount.

The combined data base included many more sites for mapping of ion concentrations and ion deposition than did any individual network; however, the number of sites differed greatly from state to state or province. The fewest sites for mapping the means of PWMM ion concentrations and pH values were in West Virginia (2), whereas the most sites were in Ontario (28). The fewest sites for mapping the means of monthly ion deposition were in West Virginia and Kentucky (1 each), and the most sites were in Ontario (24).

Ion Concentration and pH

The lowest mean PWMM pH values and highest mean PWMM hydrogen ion and sulfate concentrations in the study area were in eastern Ohio, Pennsylvania, western New York, and southern Ontario. Means of PWMM pH values ranged from 4.18 in eastern Ohio to 4.45 in northwestern Indiana (fig. 2). Means of PWMM sulfate concentrations ranged from 1.9 mg/L (milligrams per liter) in western Indiana to 5.4 mg/L in southern Ontario (fig. 3).

Means of PWMM nitrate and chloride concentrations generally corresponded to the same areal distribution pattern as pH, hydrogen ion, and sulfate. The highest mean PWMM concentrations of nitrate and chloride were in southern Ontario (figs. 4 and 5). Means of PWMM nitrate concentrations ranged from 1.22 mg/L in western Indiana to 3.46 mg/L in southern Ontario. Means of PWMM chloride concentrations ranged from 0.08 mg/L in Michigan to 0.40 mg/L in southern Ontario.

Means of PWMM concentrations of most cations, like those for most anions, were higher in southern Ontario than in any other part of the study area. Means of PWMM ammonium concentrations ranged from 0.20 mg/L in western Indiana to 0.86 mg/L in southern Ontario. Means of PWMM concentrations of potassium, calcium, and magnesium were all greater in Ontario than in any other area. Gradients of mean PWMM concentrations of these four cations increase from south to north (figs. 6-10).

Ion Deposition

Areal patterns of ion deposition can differ from areal patterns of ion concentration depending on the quantity of precipitation that is received for any time period at a specific location. However, most areal patterns in ion deposition were similar to those for ion concentrations, probably because the 3-year minimum record length compensated for any unusual precipitation patterns.

The means of monthly amounts of precipitation increased from west to east within the study area (fig. 11). Areas of highest mean monthly amounts of precipitation were in northern and central New York and eastern West Virginia. The means of monthly amounts of precipitation ranged from 5.1 to 10.5 cm (centimeter). These large differences can have a great influence on ion-deposition estimates if the estimates are obtained from data sets with relatively short periods of record. However, the areas receiving the greatest amounts of precipitation did not coincide with the areas receiving the greatest amounts of ion deposition.

Areal patterns in the means of monthly hydrogen and sulfate deposition were similar to the concentration patterns. Within the study area, deposition of both ions was greatest in eastern Ohio, western Pennsylvania, western New York, and southern Ontario, where the range of the means of monthly hydrogen ion deposition was from 2.5 to 7.5 mg/m^2 (milligrams per square meter). The range of the means of monthly hydrogen ion deposition was two to three times lower in States outside this area (fig. 2). The range of the means of monthly sulfate ion deposition was from 3 to 5 g/m^2 (gram per square meter) in Ohio, Pennsylvania, western New York, and southern Ontario, whereas the range of the means of monthly deposition of sulfate ion in other areas was from 2 to 3 g/m^2 (fig. 3).

The areal patterns of means of monthly nitrate and ammonium ion deposition were similar to concentration patterns. The means of monthly nitrate and ammonium ion deposition appear to increase from south to north in the study area. The area of greatest nitrate and ammonium deposition was in southern Ontario. The range of the means of monthly nitrate deposition in southern Ontario was from 0.15 to 0.23 g/m^2. The range of the means of monthly nitrate deposition outside southern Ontario was from 0.09 to 0.21 g/m^2 (fig. 4). The means of monthly ammonium ion deposition ranged from 0.016 to 0.062 g/m^2 (fig. 6).

The areal patterns in the means of monthly chloride deposition differed from concentration patterns. Throughout the study area, the means of monthly chloride ion deposition ranged from 0.004 to 0.025 g/m^2 except for a site in eastern New York where the highest mean of all monthly values was 0.12 g/m^2. This site could be affected by sea salts and increased precipitation because of its location (fig. 5).

Areal patterns in the means of monthly sodium and potassium deposition differed from concentration patterns. The highest mean of monthly sodium deposition was 0.065 g/m^2 at a site in New York that was probably affected by sea salt because of its location. At all other sites, the means of monthly sodium deposition ranged from 3 to 30 times lower (fig. 7). The means of monthly potassium deposition ranged from 0.001 to 0.007 g/m^2 and were only slightly higher in southern Ontario than in the rest of the study area (fig. 8).

Areal patterns in the means of monthly calcium and magnesium deposition were similar to concentration patterns. The highest means of monthly deposition for both was in southern Ontario, where values were two to four times higher for calcium and two to three times higher for magnesium than at most sites outside Ontario (figs. 9 and 10).

Relations of Ion Concentration and pH to Amount of Precipitation and Season

Statistical Methods Used

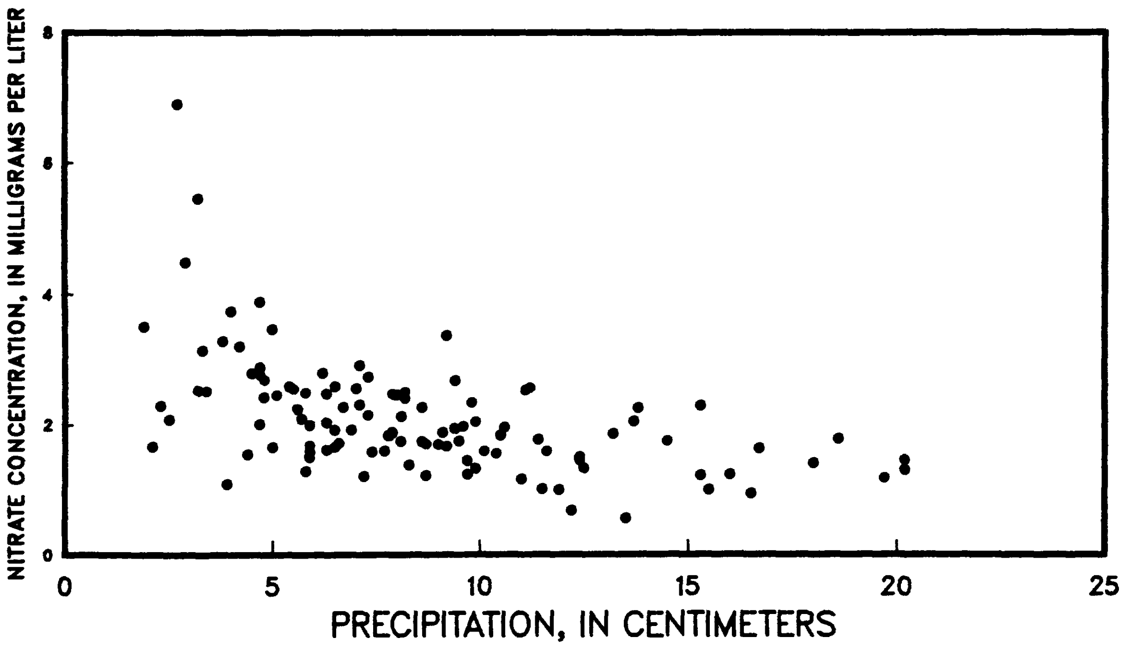
A statistical relation between the concentration of ions in weekly precipitation samples and volume of precipitation and season of the year was found by Schertz and Hirsch (1985) by use of linear and multiple linear regression analysis of data from 19 sites in the National Trends Network. A similar approach was used in this study to analyze PWMM values and monthly amount of precipitation and season. These relations were examined at 42 sites in the study area for which a minimum of 5 years of data are available.

Several conditions must be met in regression analysis to avoid errors in the estimation of regression coefficients and predicted concentrations. Two of these conditions are that the sample be representative of the population and that there be a linear correlation between dependent and explanatory variables. The other conditions are concerned with the differences between the observed and predicted values, which are known as the regression residuals. The conditions regarding the regression residuals are that they be approximately normal and independent and that their variance be homoscedastic with respect to the dependent variable. If the conditions concerning the regression residuals are not met, serious errors in the estimates of the coefficients of the regression can be made.

Scatterplots of PWMM nitrate and calcium concentrations and concurrent monthly amounts of precipitation at Ithaca, N.Y., and Alvinston, Ontario, sites 044a and 180a, respectively, are shown in figs. 12 and 13. Site 044a represents data obtained from a network in which samples are collected for each precipitation event, whereas site 180a represents data from a network in which samples of precipitation are collected and combined into one sample on a 28-day schedule. Data from both sites produced similar scatterplots of increasing concentration with decreasing amount of precipitation. These sites are representative of the general pattern for all ions and at most sites investigated in this study. Some curvature is apparent in the scatterplot for sites 044a and 180a; similar curvature was noted in plots for all ions at most sites in the study area.

Several different transformations of the explanatory and (or) dependent and explanatory variables were tried in regression models relating ion concentrations to amounts of precipitation. Most transformations resulted in residuals that were not normally distributed at a comparatively large number of sites. These included regressions in which no transformation, a reciprocal transformation, a natural-log transformation, and an inverse square-root transformation were applied to amount of precipitation. The curvature in the scatterplots between concentration and

A. ITHACA, N.Y., SITE 044a.



B. ALVINSTON, ONT., SITE 180a

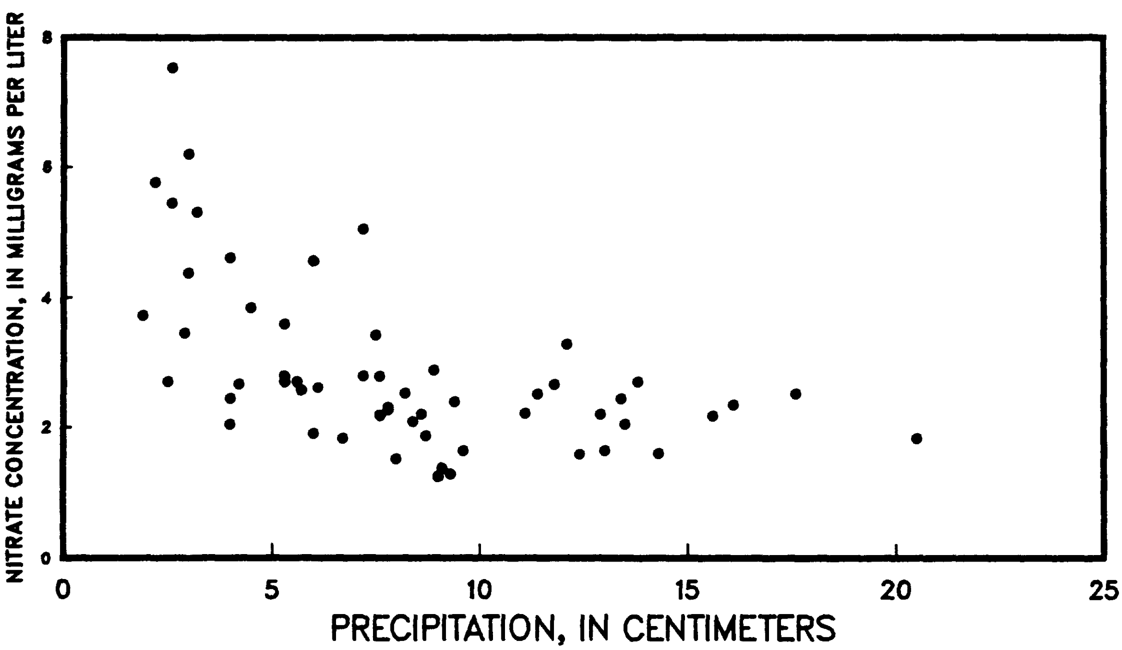
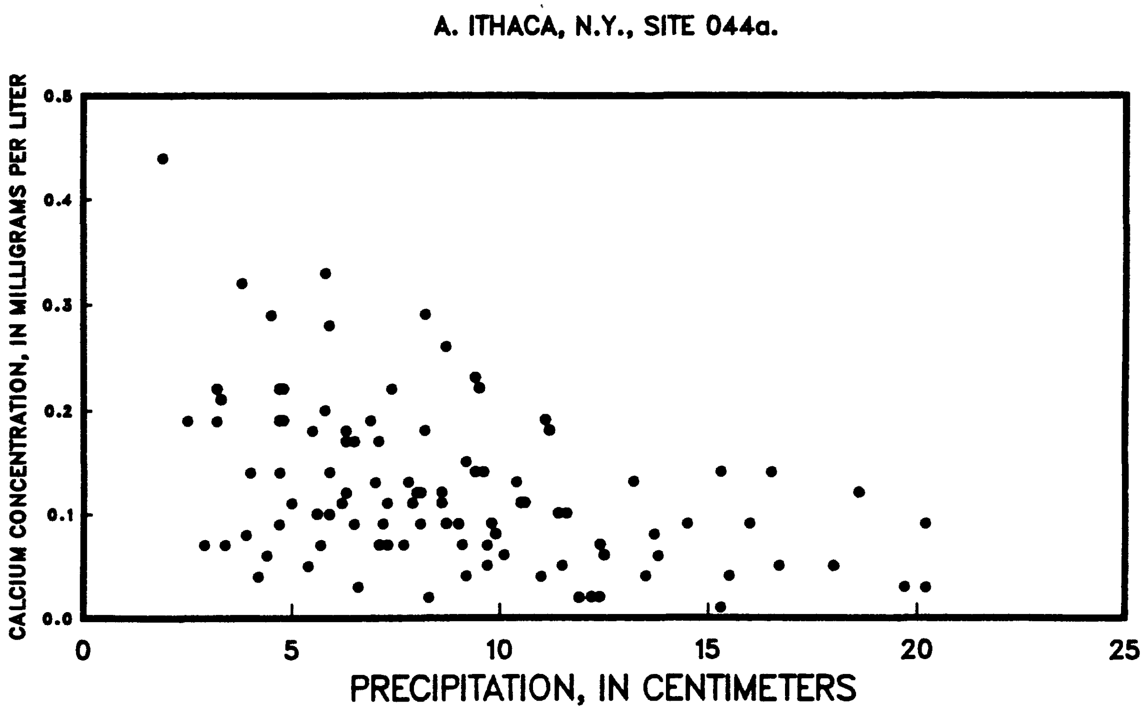


Figure 12.--Relation between nitrate concentration and amount of precipitation for (A) Ithaca, N.Y. and (B) Alvinston, Ont.



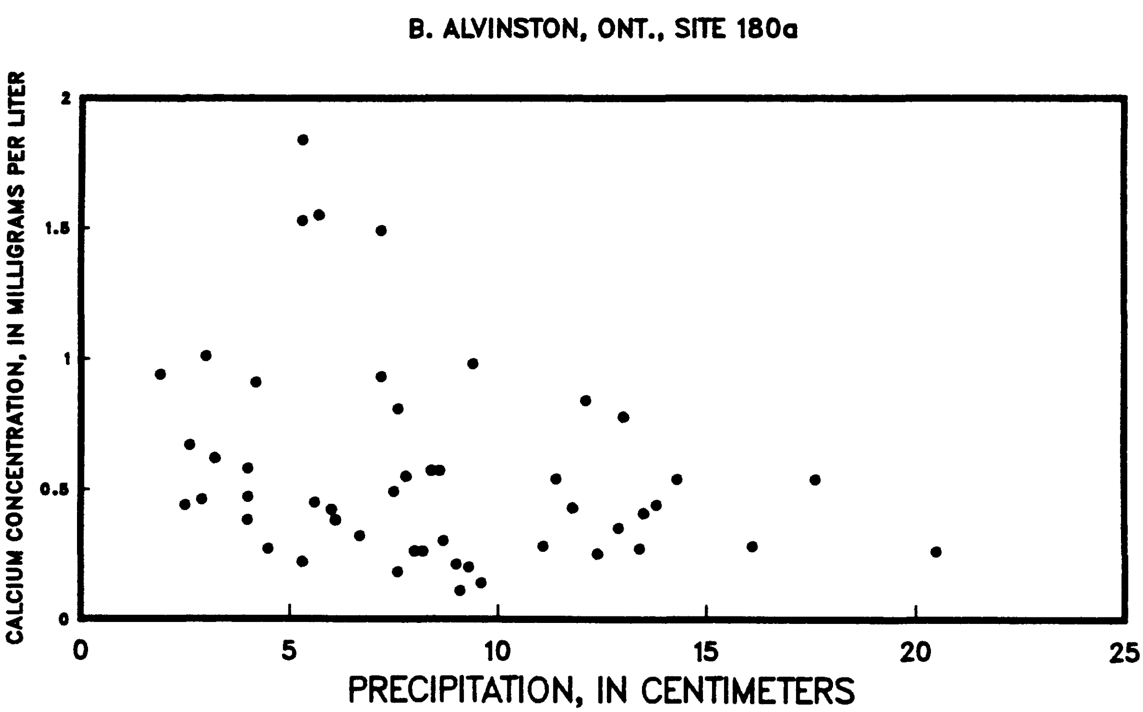


Figure 13.--Relation between calcium concentration and amount of precipitation for (A) Ithaca, N.Y., and (B) Alvinston, Ont.

amount of precipitation was eventually eliminated by use of the natural-log transformation of both variables. Examples of the result are shown in figures 14 and 15 for nitrate and calcium, respectively, at sites 044a and 180a.

The slopes of regression lines were tested to determine whether they were significantly different from zero by use of the t-test on the slope coefficent (α=0.05) from the regression equation that takes the form

$$\ln C = a + b * \ln(P), \qquad (1)$$

where C is mean concentration (mg/L),
a is the intercept,
b is the slope,
ln is the natural log, and
P is monthly amount of precipitation (cm).

An analysis of the residuals of the regressions between the natural log of concentration and amount of precipitation can indicate whether conditions regarding the regression residuals have been met or whether additional methods need to be employed (such as use of a different transformation or addition of more variables to the model). Residuals of the regressions between the natural logs of concentration and amount of precipitation were tested for normality by use of the Kolomogorov D statistic. For nearly all sites for which the slope of the regression was significantly different from zero, the distribution of regression residuals was approximately normal. If the distribution of regression residuals for any model was determined not to be normal or approximately normal, then the residuals from the model were not used in subsequent statistical tests.

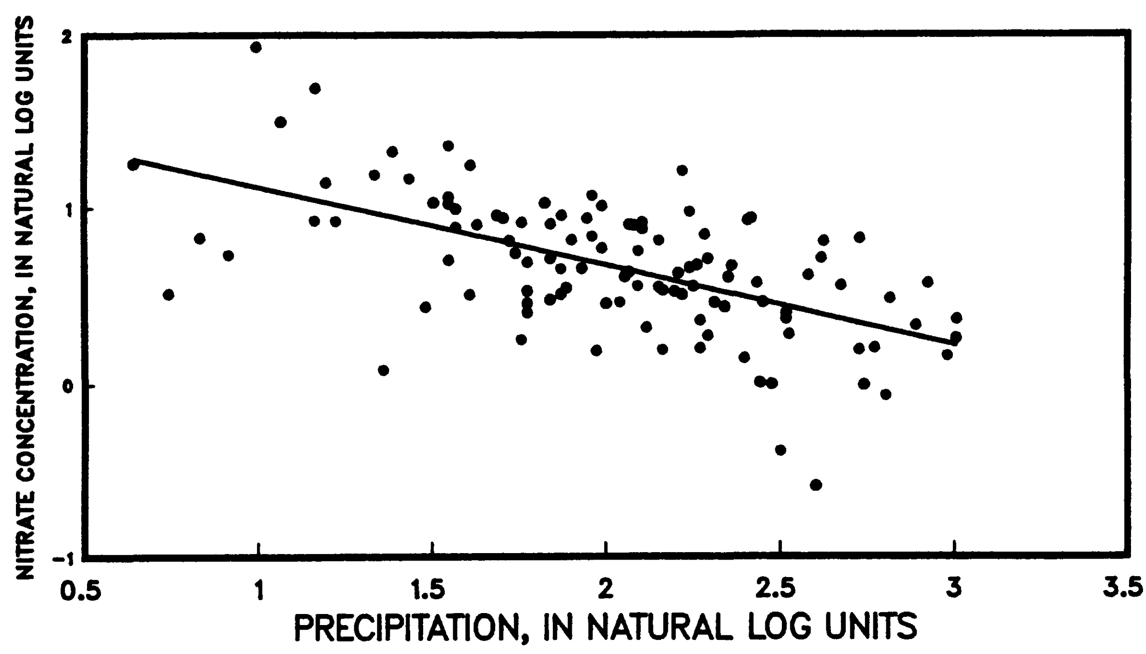
Precipitation-chemistry data, like most environmental data, can exhibit seasonality that can be observed in a smoothed residuals scatterplot. The smoothed nitrate residuals (fig. 16), for example, show a seasonal pattern. Additional explanatory variables can be added to the simple regression model to account for variations observed from season to season. The form of the equation that describes this relation is

$$\ln(C) = a + b * \ln(P) + c * \sin(2\Pi T) + d * \cos(2\Pi T), \qquad (2)$$

where C is concentration (mg/L),
P is the amount of precipitation (cm),
ln is the natural log,
a is the intercept,
b is the slope,
c and d are seasonal regression coefficients, and
T is time (years).

The use of the periodic functions of sine and cosine in the regression equation (Box and Jenkins, 1976) adjusts the equation for the rise and fall of the annual cycles of concentration.

A. ITHACA, N.Y., SITE 044a.



B. ALVINSTON, ONT., SITE 180a

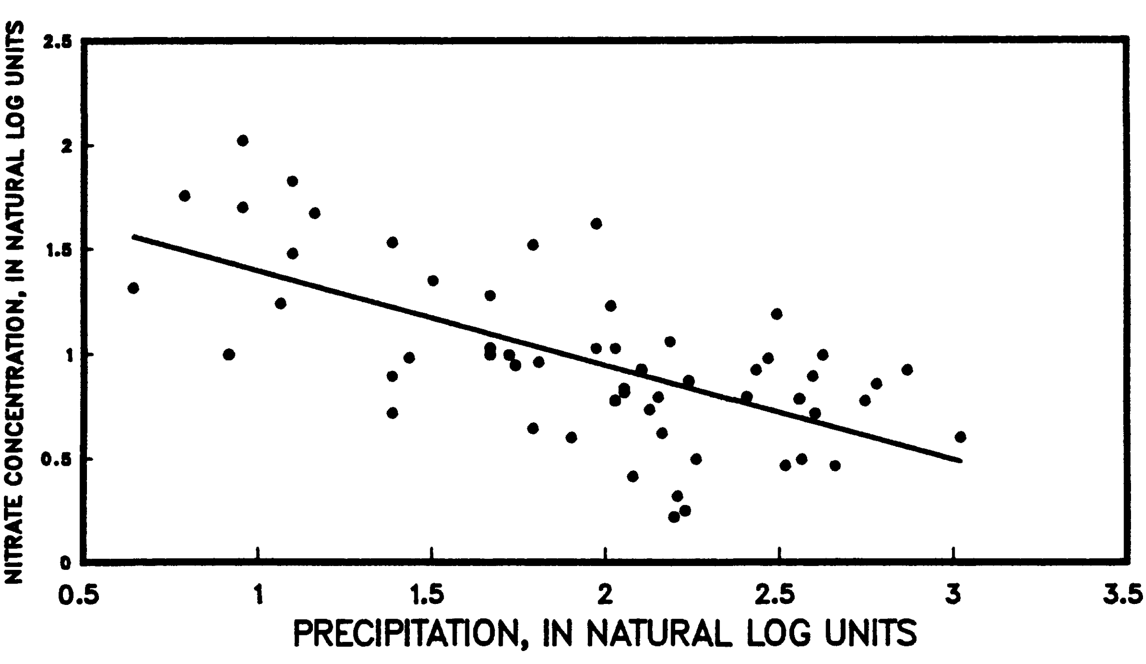


Figure 14.--Relation between natural log of nitrate concentration and natural log of amount of precipitation for (A) Ithaca, N.Y., and (B) Alvinston, Ont.

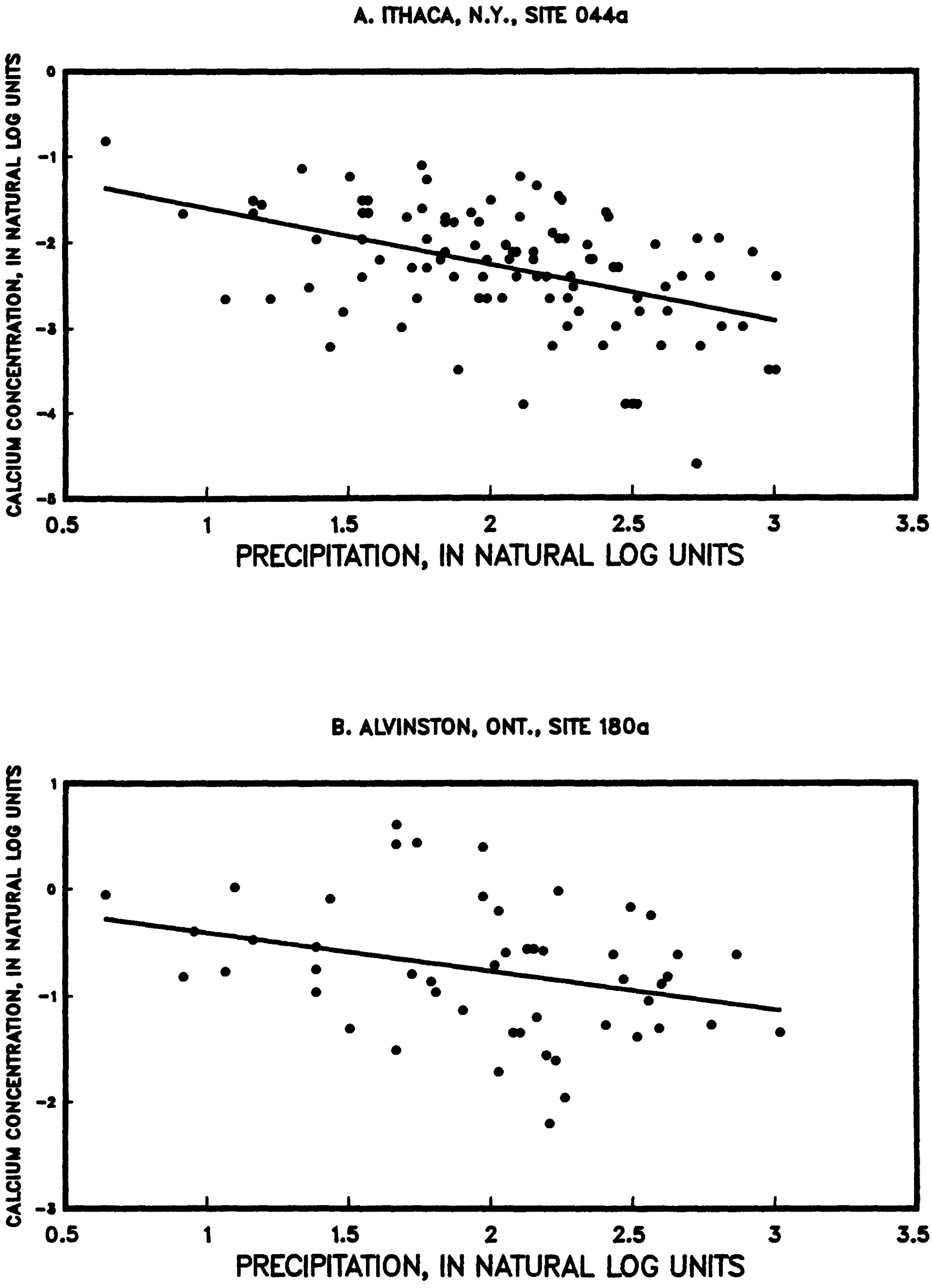


Figure 15.--Relation between natural log of calcium concentration and natural log of amount of precipitation for (A) Ithaca, N.Y., and (B) Alvinston, Ont.

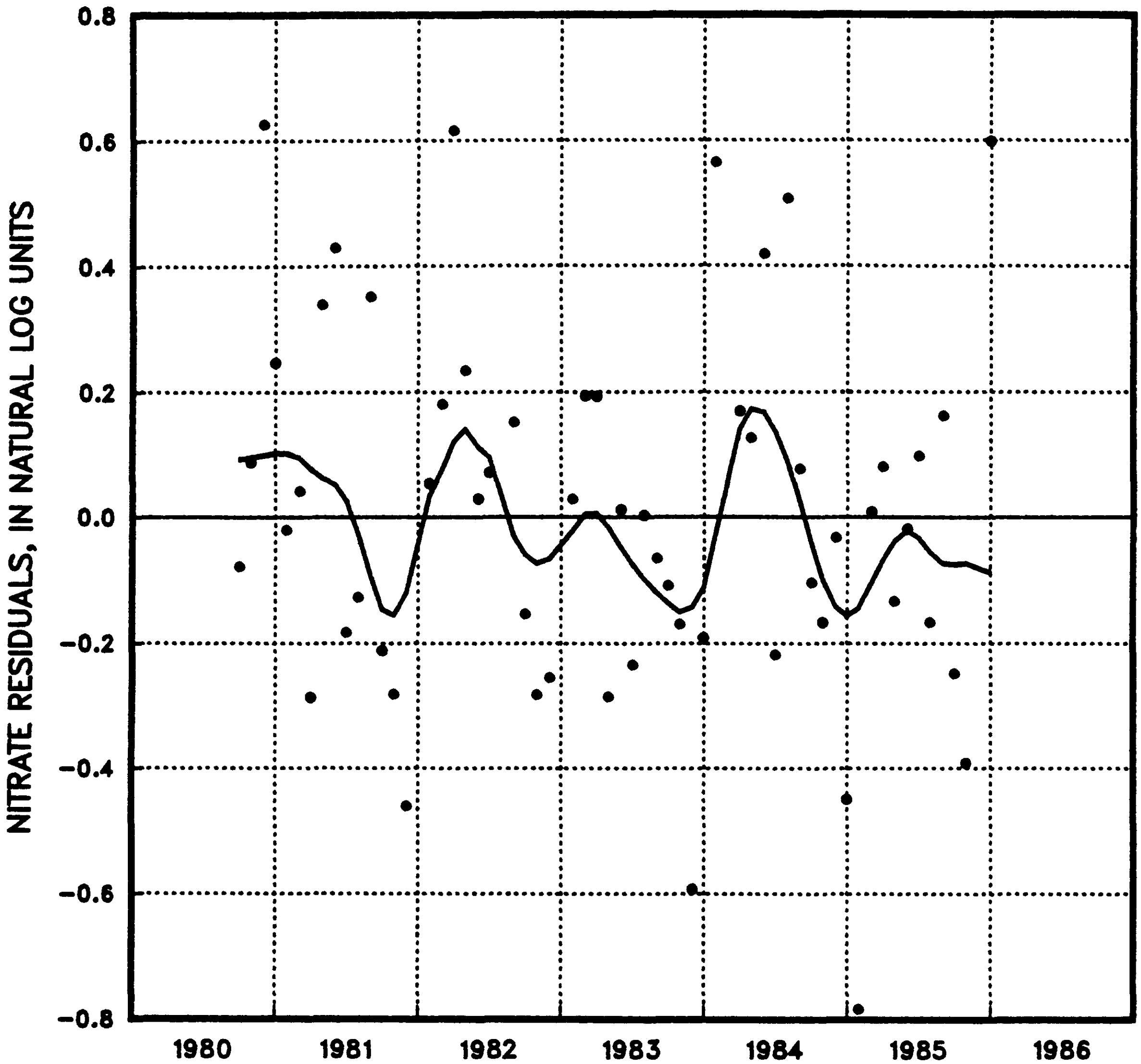


Figure 16.--Seasonal pattern in nitrate regression residuals for Palmerston, Ont., (site 182a), detected by use of LOWESS data-smoothing technique applied to the time series of nitrate data.

The coefficients obtained from the regressions were required to be significant at $\alpha=0.05$ to be retained in the model; however, it is legitimate to retain sine and cosine functions in the model even when one is not significant, because both coefficients could be significant when used together. If one or the other is dropped from the model, the periodic term is forced to have an arbitrary phase shift rather than a shift determined by the data (D.R. Helsel, U.S. Geological Survey, written commun., 1987).

Comparison of the seasonal model to the simple model (in which only amount of precipitation was an explanatory variable) was done by use of an F-test on the nested models. The F-test compares the error-sum-of-squares values and residual degrees of freedom for each of the two regression models (Draper and Smith, 1981). In addition, the F-test determines whether the sine and cosine variables in the seasonal model are significant when used together, because the simple model and the seasonal model are nested. If the calculated F-value is greater than the tabulated value at $\alpha=0.05$, then the hypothesis that coefficients of the additional variables in the seasonal model are not different from zero can be rejected, and the seasonal model can be chosen over the simple model. If the F-test is significant, the seasonal model (the more complex model) is selected because it does a better job of explaining variation in ion concentrations or pH than the simple model does. The slopes of the regressions between the natural logs of ion concentration or pH and natural logs of amount of precipitation are presented in tables 3 through 11. Also presented in these tables are the significance levels for the regression, the model used to describe the relation between the natural logs of ion concentrations and amount of precipitation, the probability of an F-value being greater than the test statistic, and the probability associated with the model chosen to represent each site.

If one of the regression models was significant but the other was not, an overall F-test was used. The overall F-test determines whether the regression model is better than no model. The error-sum-of-squares and residual degrees of freedom from the regression model are compared in magnitude to the sum of squares and degrees of freedom from the original, untransformed ion-concentration or pH data set.

Tests for normality of residuals of the seasonal regressions were done for pH, sulfate, and nitrate residuals at sites for which these models were chosen. Figures 17 through 19 are box plots of the seasonal regression residuals for sulfate, nitrate, and calcium at all sites in the study area for which a significant seasonal model was detected. The box plots of these regression residuals are fairly symmetrical, although the results of the Kologomorov test for normality of the regression residuals was rejected in a few instances.

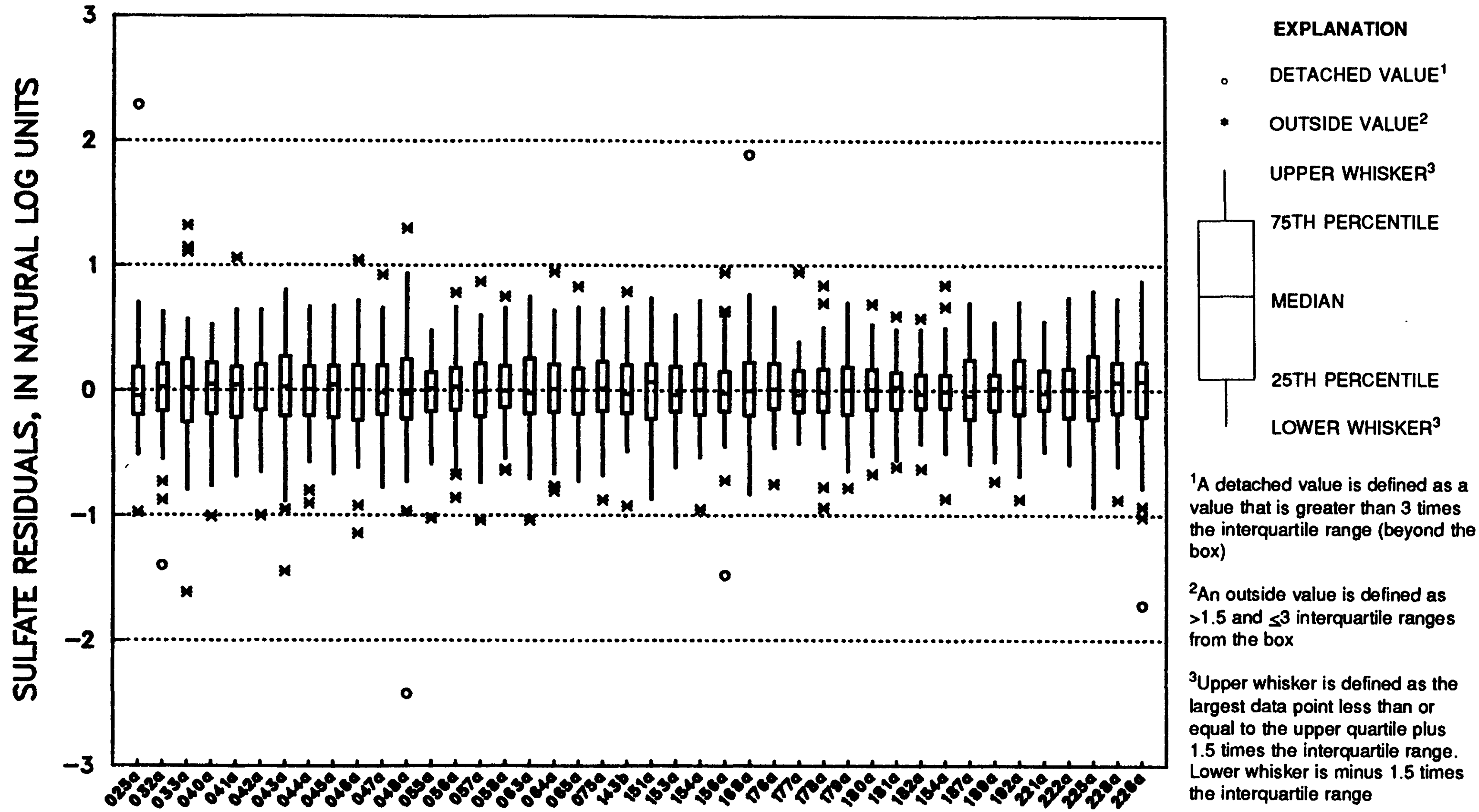


Figure 17.—Box plots showing distribution of regression residuals for sulfate at all sites for which the seasonal regression model was significant.

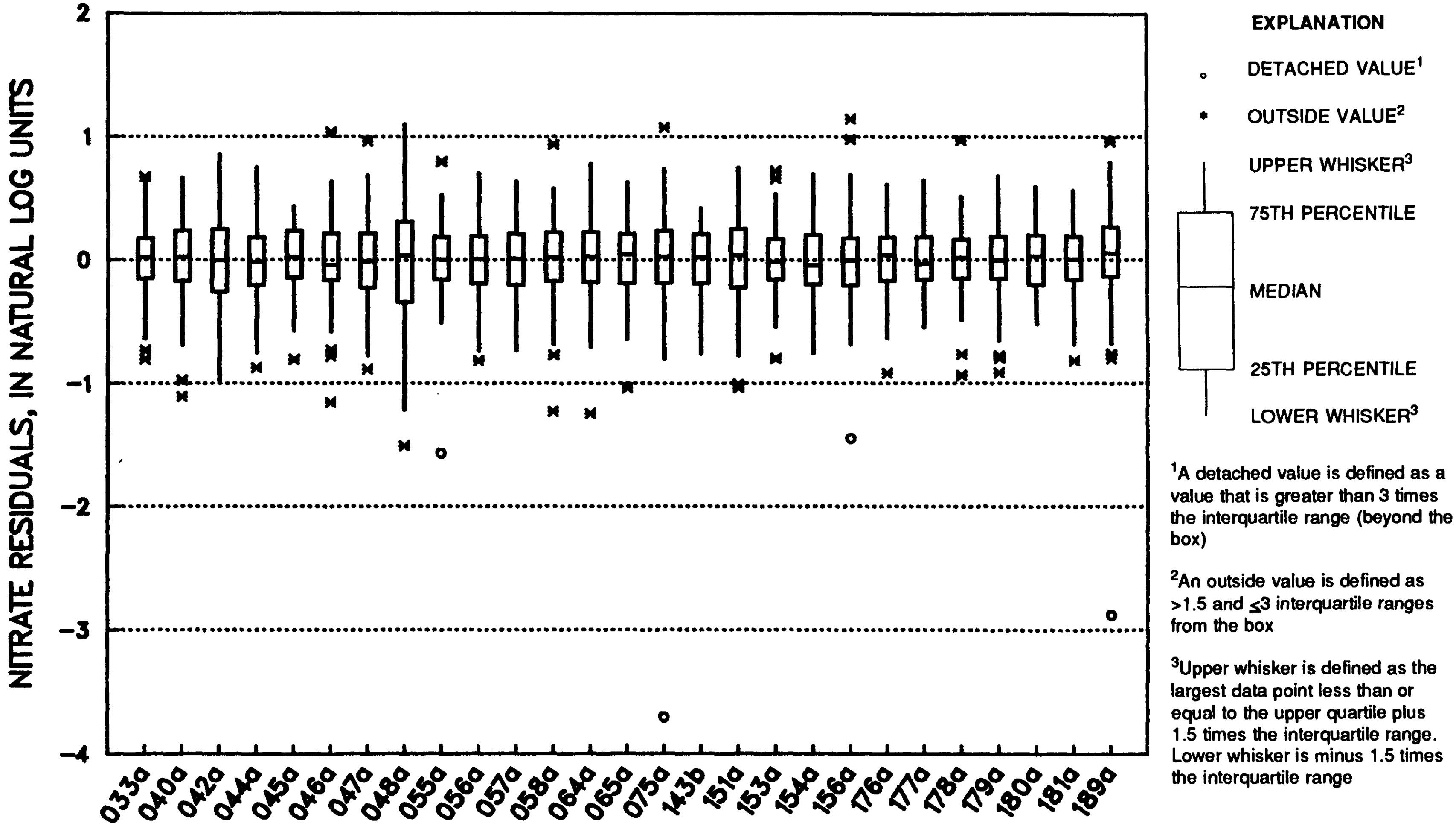


Figure 18.—Box plots showing distribution of regression residuals for nitrate at all sites for which the seasonal regression model was significant.

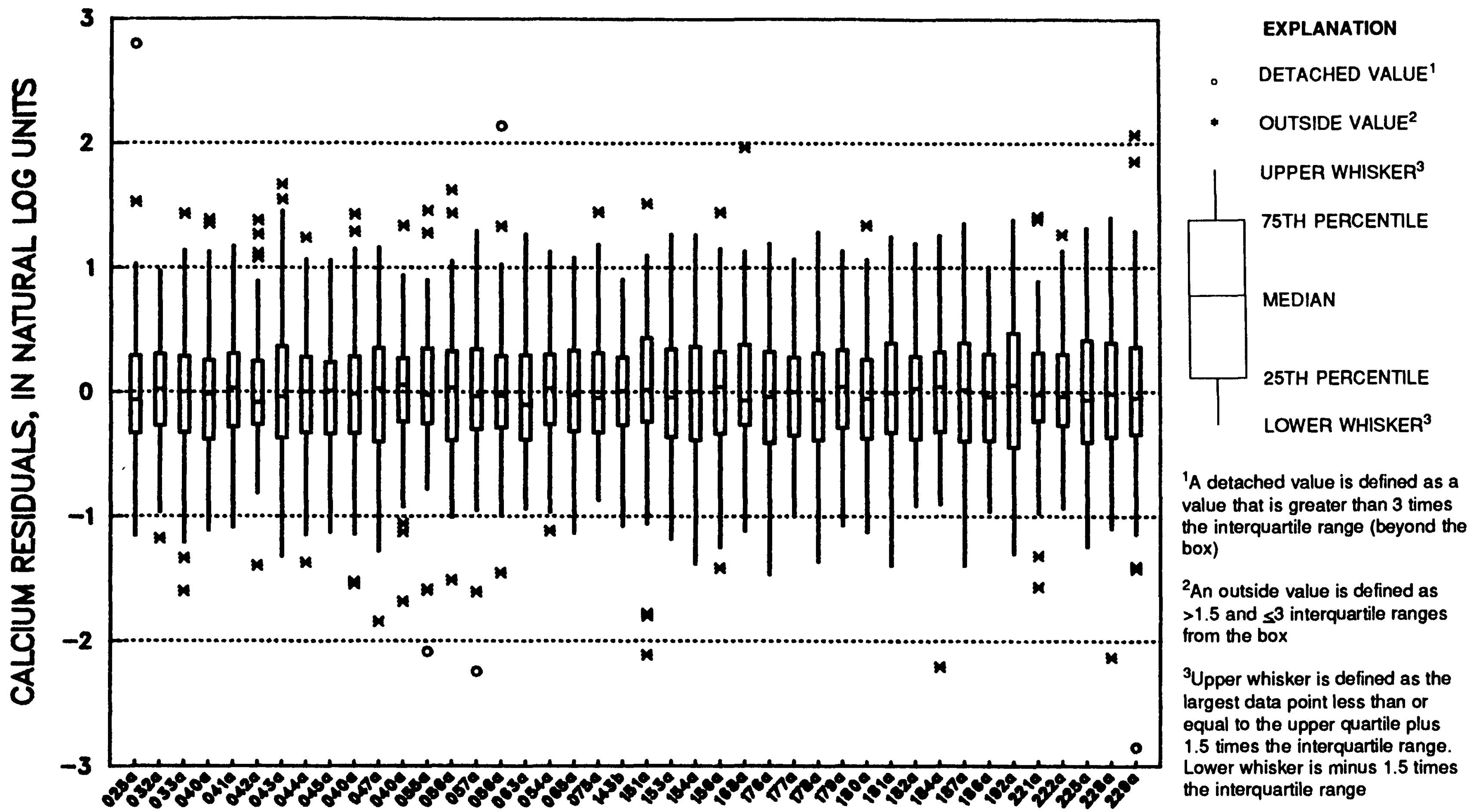


Figure 19.—Box plots showing the distribution of regression residuals of for calcium at all sites for which the seasonal regression model was significant.

At sites for which the seasonal regression coefficients are significant, the regression coefficients for the sine and cosine variables can be used (1) to estimate the day of the year on which the highest concentration of a chemical constituent in precipitation can be expected (peak day), and (2) as a measure of the magnitude of change in concentration (amplitude of the sine wave, or half the distance from peak to trough).

The peak day and amplitude are calculated by conversion of the seasonal terms in the formula

$$y = c * \sin(2\Pi T) + d * \cos(2\Pi T) \tag{2}$$

to

$$y = f * \sin(2\Pi(T+T_0)), \tag{3}$$

where f is the amplitude and T is the phase shift of the seasonal term. The amplitude and phase shift can be calculated from the following equations:

$$f = (c^2 + d^2)^{1/2} \tag{4}$$

$$T = (1/2\Pi)*\arctan(c/d). \tag{5}$$

The phase shift can be converted to a peak day by use of the following calculation:

$$T_{max} = 1/4 - T_0; \tag{6}$$

if T_{max} is less than 0, let $T_{max} = T_{max}+1$, and

if T_{max} is greater than 1, let $T_{max} = T_{max}-1$,

where T_{max} is the peak of the sine wave, in years. To convert T_{max} in years to day of the year (D_{max})--

$$D_{max} = T_{max} * 365. \tag{7}$$

The amplitude is expressed in log units and the peak day as a Julian calendar day.

Relations of Ion Concentration and pH to Amount of Precipitation

The sign of the slope of the regression line relating pH and ion concentrations to amount of precipitation is an indicator of how ion concentrations vary with the amount of precipitation. A negative slope for the regression line relating ion concentration to amount of precipitation indicates that the concentrations of ions dissolved in precipitation increase as amounts of precipitation decrease. The slopes for all of the regression lines for ion concentrations evaluated in this study were negative, whereas slopes for pH were all positive (tables 3-11).

The magnitude of the slope describes the rate of change of the pH or ion concentration value with change in amount of precipitation. The greater the slope, the greater the change in concentration or pH that occurs with change in amount of precipitation. (For example, a slope of 1.0 would mean that, for a one-unit change in amount of precipitation, a one-unit change in concentration could be expected.) The regression coefficients for slope (in decreasing order) were steepest for nitrate and sulfate, followed by ammonium, calcium, chloride, and pH. The slopes for sodium, potassium, and magnesium, which generally were less than 0.1, indicate that amount of precipitation has a small effect on the monthly mean concentrations of these three cations.

Overall, the slopes of the regressions of ion concentrations or pH and amount of precipitation found in this study were less than those determined by Schertz and Hirsch (1985). Ion concentrations in weekly samples could be more closely related to volume of precipitation than are monthly mean ion concentrations. Peters and others (1982) regressed monthly ion concentrations from bulk-precipitation samples against monthly amount of precipitation, and a curvilinear (hyperbolic) relation was determined for some sites; however, Peters and others (1982) found no relation or a linear relation between concentration and amount of precipitation at several sites.

Other descriptive statistics for the regression equations used in this study are the standard error and the coefficient of determination (r^2). The standard-error values for most regression equations, which ranged from 50 to greater than 100 percent, indicate that these statistical models cannot predict with much certainty the concentrations of ions and pH in precipitation for any given rainfall amount. The standard errors for sulfate and nitrate regressions were the smallest, standard errors for sulfate regressions were approximately 35 percent, and standard errors for nitrate were approximately 50 percent.

The coefficient of determination describes the proportion or percentage of variation in the dependent variable (y) accounted for by the simple linear regression on x. Values near 1.0 indicate that the explanatory variable (x) of amount of precipitation does a very good job of accounting for the variations observed in pH or ion concentration, whereas values near zero indicate that the regression model does a poor job of accounting for the variations in ion concentration. The r^2 values for the regression models relating amount of precipitation to ion concentration examined in this study ranged from 0.06 to 0.73, and most were less than 0.5. The highest r^2 values were for sulfate and nitrate, and r^2 values for some of these models were greater than 0.50. As a group, the cation models were characterized by the lowest r^2 values.

Table 3.--Description of seasonal and precipitation-related characteristics of statistical models for pH

[--, no data]

Site ID	Station name	Slope	Standard error (pH units)	r^2 [1]	Peak day	Amplitude (ln units)	P-value[2] of model used	P-value[2] of comparison F-test	Model used
025a	Indiana Dunes, Ind.	0.10	7.3	0.19	44	0.18	0.000	0.014	S
032a	Kellogg, Mich.	--	4.8	--	--	--	.293	--	N
033a	Wellston, Mich.	--	4.5	--	--	--	.108	--	N
040a	Aurora, N.Y.	.17	4.3	.37	34	.21	.000	.000	S
041a	Chautauqua, N.Y.	.08	4.2	.22	29	.14	.001	.003	S
042a	Knobit, N.Y.	.16	3.9	.59	28	.26	.000	.000	S
043a	Whiteface, N.Y.	.08	3.8	.20	35	.12	.000	.000	S
044a	Ithaca, N.Y.	.13	3.3	.41	25	.15	.000	.000	S
045a	Stilwell Lake, N.Y.	.16	3.3	.62	16	.19	.000	.000	S
046a	Bennett Bridge, N.Y.	.13	4.6	.21	20	.10	.000	.021	S
047a	Jasper, N.Y.	.05	3.7	.46	18	.23	.000	.000	S
048a	Brookhaven, N.Y.	.13	4.8	.31	22	.14	.000	.000	S
055a	Delaware, Ohio	.03	3.2	.30	19	.13	.000	.000	S
056a	Caldwell, Ohio	--	5.7	--	--	--	.018	--	N
057a	Oxford, Ohio	.34	3.7	.21	34	.10	.000	.000	S
058a	Wooster, Ohio	.12	4.2	.31	19	.15	.000	.000	S
063a	Kane, Pa.	.04	4.5	.30	25	.15	.000	.000	S
064a	Leading Ridge, Pa.	.12	3.4	.58	20	.24	.000	.000	S
065a	Penn State, Pa.	.11	3.6	.45	29	.20	.000	.000	S
075a	Parsons, W. Va.	.09	3.4	.50	28	.21	.000	.000	S
143b	Longwoods, Ont.	--	4.2	--	--	--	.048	.104	N
151a	Scranton, Pa.	.12	3.8	.48	16	.19	.000	.000	S
153a	Zanesville, Ohio	.04	3.5	.30	22	.11	.000	.000	S
154a	Rockport, Ind.	.08	3.2	.34	21	.12	.000	.000	S
156a	Fort Wayne, Ind.	--	5.7	--	--	--	.063	--	N
168a	Huntington, N.Y.	.12	4.4	.21	31	.11	.001	.000	S
176a	Colchester, Ont.	.10	4.8	.21	31	.15	.006	.007	S
177a	Merlin, Ont.	--	6.4	--	--	--	.045	.098	N
178a	Port Stanley, Ont.	--	6.1	--	--	--	.113	--	N
179a	Wilkesport, Ont.	--	7.0	--	--	--	.452	--	N
180a	Alvinston, Ont.	.23	9.2	.20	39	.28	.009	.015	S
181a	Shallow Lake, Ont.	.11	4.3	.08	--	--	.038	.037	P
182a	Palmerston, Ont.	--	6.7	--	--	--	.773	--	N
184a	Waterloo, Ont.	--	6.5	--	--	--	.323	--	N
187a	Uxbridge, Ont.	--	7.4	--	--	--	.102	--	N
189a	Campbellford, Ont.	.11	5.5	.09	--	--	.030	.026	P
192a	Smiths Falls, Ont.	--	6.4	--	--	--	.135	--	N
221a	Melbourne, Ont.	.11	3.8	.19	37	.09	.013	.020	S
222a	North Easthope, Ont.	.19	4.1	.27	44	.13	.001	.013	S
225a	Balsam Lake, Ont.	--	4.6	--	--	--	.324	--	N
228a	Railton, Ont.	--	4.5	--	--	--	.048	.089	N
229a	Graham Lake, Ont.	--	5.3	--	--	--	.350	--	N

[1] r^2 is the coefficient of determination of the regression between log of concentration and log of amount of precipitation.

[2] P-value is the smallest level of significance that would allow the null hypothesis to be rejected.

[3] S, seasonally adjusted model; P, precipitation-adjusted model; N, no model.

Table 4.--Description of seasonal and precipitation-related characteristics of statistical models for sulfate concentration

[--, no data]

Site ID	Station name	Slope	Standard error (pH units)	r^2 [1]	Peak day	Amplitude (ln units)	P-value[2] of model used	P-value[2] of comparison F-test	Model used
025a	Indiana Dunes, Ind.	-0.19	36.0	0.22	198	0.28	0.001	0.010	S
032a	Kellogg, Mich.	-.16	31.1	.35	206	.34	.000	.000	S
033a	Wellston, Mich.	-.39	53.4	.35	213	.38	.000	.000	S
040a	Aurora, N.Y.	-.36	26.6	.62	209	.60	.000	.000	S
041a	Chautauqua, N.Y.	-.29	28.2	.42	209	.40	.000	.000	S
042a	Knobit, N.Y.	-.32	46.0	.69	213	.68	.000	.000	S
043a	Whiteface, N.Y.	-.21	64.8	.56	210	.64	.000	.000	S
044a	Ithaca, N.Y.	-.25	33.6	.72	207	.68	.000	.000	S
045a	Stilwell Lake, N.Y.	-.30	37.5	.56	202	.42	.000	.000	S
046a	Bennett Bridge, N.Y.	-.49	35.4	.45	217	.34	.000	.000	S
047a	Jasper, N.Y.	-.19	37.7	.60	204	.62	.000	.000	S
048a	Brookhaven, N.Y.	-.29	60.7	.34	202	.34	.000	.000	S
055a	Delaware, Ohio	-.11	23.0	.54	200	.40	.000	.000	S
056a	Caldwell, Ohio	-.16	22.8	.51	204	.42	.000	.000	S
057a	Oxford, Ohio	-.06	32.1	.46	--	--	.000	.000	P
058a	Wooster, Ohio	-.24	24.7	.40	201	.35	.000	.000	S
063a	Kane, Pa.	-.16	30.9	.51	206	.44	.000	.000	S
064a	Leading Ridge, Pa.	-.25	31.9	.63	205	.62	.000	.000	S
065a	Penn State, Pa.	-.25	30.5	.73	210	.73	.000	.000	S
075a	Parsons, W. Va.	-.26	33.8	.46	207	.46	.000	.000	S
143b	Longwoods, Ont.	-.12	25.4	.52	200	.41	.000	.000	S
151a	Scranton, Pa.	-.18	44.3	.65	201	.68	.000	.000	S
153A	Zanesville, Ohio	-.13	25.3	.61	202	.46	.000	.000	S
154a	Rockport, Ind.	-.12	30.5	.49	200	.40	.000	.000	S
156a	Fort Wayne, Ind.	-.10	32.2	.36	199	.35	.000	.000	S
168a	Huntington, N.Y.	-.26	58.3	.53	211	.57	.000	.000	S
176a	Colchester, Ont.	-.32	18.4	.63	201	.51	.000	.000	S
177a	Merlin, Ont.	-.32	17.0	.57	195	.39	.000	.000	S
178a	Port Stanley, Ont.	-.36	20.9	.52	181	.38	.000	.000	S
179a	Wilkesport, Ont.	-.41	18.9	.56	201	.43	.000	.000	S
180a	Alvinston, Ont.	-.42	21.1	.63	191	.44	.000	.000	S
181a	Shallow Lake, Ont.	-.31	23.1	.56	196	.39	.000	.000	S
182a	Palmerston, Ont.	-.21	20.1	.42	196	.31	.000	.000	S
184a	Waterloo, Ont.	-.21	23.6	.48	193	.43	.000	.000	S
187a	Uxbridge, Ont.	-.13	25.0	.41	189	.34	.000	.000	S
189a	Campbellford, Ont.	-.29	21.5	.75	201	.62	.000	.000	S
192a	Smiths Falls, Ont.	-.26	34.0	.60	213	.62	.000	.000	S
221a	Melbourne, Ont.	-.23	21.3	.56	205	.37	.000	.000	S
222a	North Easthope, Ont.	-.37	28.4	.48	217	.40	.000	.000	S
225a	Balsam Lake, Ont.	-.05	43.4	.51	203	.49	.000	.000	S
228a	Railton, Ont.	-.25	31.7	.38	215	.33	.000	.000	S
229a	Graham Lake, Ont.	-.11	51.1	.27	202	.37	.000	.000	S

[1] r^2 is the coefficient of determination of the regression between log of concentration and log of amount of precipitation.

[2] P-value is the smallest level of significance that would allow the null hypothesis to be rejected.

[3] S, seasonally adjusted model; P, precipitation-adjusted model; N, no model.

Table 5.--Description of seasonal and precipitation-related characteristics of statistical models for nitrate concentration

[--, no data]

Site ID	Station name	Slope	Standard error (pH units)	r^2[1]	Peak day	Amplitude (ln units)	P-value[2] of model used	P-value[2] of comparison F-test	M u
025a	Indiana Dunes, Ind.	-0.34	68.2	0.24	--	--	0.000	0.000	
032a	Kellogg, Mich.	-.29	39.0	.35	--	--	.000	.000	
033a	Wellston, Mich.	-.40	46.3	.45	73	0.17	.000	.010	
040a	Aurora, N.Y.	-.35	45.0	.28	162	.16	.000	.015	
041a	Chautauqua, N.Y.	-.44	50.1	.31	--	--	.000	.000	
042a	Knobit, N.Y.	-.49	77.7	.41	190	.30	.000	002	
043a	Whiteface, N.Y.	-.28	132.9	.16	--	--	.000	.000	
044a	Ithaca, N.Y.	-.45	45.5	.43	131	.16	.000	.000	
045a	Stilwell Lake, N.Y.	-.50	68.6	.66	194	.32	.000	.000	
046a	Bennett Bridge, N.Y.	-.54	45.9	.38	50	.19	.000	.023	
047a	Jasper, N.Y.	-.34	71.7	.44	167	.32	.000	.000	
048a	Brookhaven, N.Y.	-.51	188.3	.43	194	.30	.000	.000	
055a	Delaware, Ohio	-.28	49.8	.44	174	.30	.000	.000	
056a	Caldwell, Ohio	-.36	45.2	.46	156	.23	.000	.000	
057a	Oxford, Ohio	-.29	62.1	.43	164	.25	.000	.000	
058a	Wooster, Ohio	-.34	54.3	.37	174	.32	.000	.000	
063a	Kane, Pa.	-.39	50.9	.20	--	--	.000	.000	
064a	Leading Ridge, Pa.	-.39	49.5	.34	175	.25	.000	.000	
065a	Penn State, Pa.	-.42	44.5	.44	184	.20	.000	.000	
075a	Parsons, W. Va.	-.80	132.7	.35	176	.42	.000	.000	
143b	Longwoods, Ont.	-.38	33.1	.38	165	.15	.000	.013	
151a	Scranton, Pa.	-.37	77.2	.42	172	.30	.000	.000	
153a	Zanesville, Ohio	-.30	50.2	.43	151	.23	.000	.000	
154a	Rockport, Ind.	-.32	136.9	.41	156	.26	.000	.000	
156a	Fort Wayne, Ind.	-.27	58.5	.28	130	.20	.001	.004	
168a	Huntington, N.Y.	-.44	93.0	.25	--	--	.000	.000	
176a	Colchester, Ont.	-.41	29.3	.47	171	.22	.000	.000	
177a	Merlin, Ont.	-.45	22.9	.64	165	.20	.000	.000	
178a	Port Stanley, Ont.	-.41	28.8	.53	137	.24	.000	.000	
179a	Wilkesport, Ont.	-.40	31.7	.38	162	.17	.000	.050	
180a	Alvinston, Ont.	-.46	29.0	.54	158	.20	.000	.004	
181a	Shallow Lake, Ont.	-.35	31.4	.40	94	.15	.000	.040	
182a	Palmerston, Ont.	-.32	32.2	.30	--	--	.000	.000	
184a	Waterloo, Ont.	-.28	65.4	.06	--	--	.072	.000	
187a	Uxbridge, Ont.	-.17	36.3	.10	--	--	.021	.000	
189a	Campbellford, Ont.	-.39	29.6	.45	201	.18	.000	.012	
192a	Smiths Falls, Ont.	-.32	44.0	.26	--	--	.000	.000	
221a	Melbourne, Ont.	-.37	29.8	.40	--	--	.000	.031	
222a	North Easthope, Ont.	-.45	38.8	.36	--	--	.000	.000	
225a	Balsam Lake, Ont.	-.31	44.4	.28	--	--	.000	.000	
228a	Railton, Ont.	-.37	55.0	.23	--	--	.000	.014	
229a	Graham Lake, Ont.	-.33	68.1	.11	--	--	.014	.000	

[1] r^2 is the coefficient of determination of the regression between log of concentration and log of amount of precipitation.

[2] P-value is the smallest level of significance that would allow the null hypothesis to be rejected.

[3] S, seasonally adjusted model; P, precipitation-adjusted model; N, no model.

Table 6.--Description of seasonal and precipitation-related characteristics of statistical models for chloride concentration

[--, no data]

Site ID	Station name	Slope	Standard error (pH units)	r^2 [1]	Peak day	Amplitude (ln units)	P-value [2] of model used	P-value [2] of comparison F-test	M u
025a	Indiana Dunes, Ind.	--	159.1	--	--	--	0.040	0.922	
032a	Kellogg, Mich.	-0.07	55.4	0.22	--	--	.000	.000	
033a	Wellston, Mich.	-.14	91.6	.27	23	0.10	.000	.009	
040a	Aurora, N.Y.	-.14	46.7	.39	--	--	.000	.001	
041a	Chautauqua, N.Y.	-.17	55.2	.51	21	.10	.000	.000	
042a	Knobit, N.Y.	-.14	63.8	.42	51	.80	.000	.009	
043a	Whiteface, N.Y.	--	68.9	--	--	--	.083	--	
044a	Ithaca, N.Y.	-.06	72.2	.13	63	.07	.001	.009	
045a	Stilwell Lake, N.Y.	--	100.5	.24	37	.51	.001	.003	
046a	Bennett Bridge, N.Y.	-.17	59.7	.42	35	.10	.000	.000	
047a	Jasper, N.Y.	-.06	51.7	.26	--	--	.000	.000	
048a	Brookhaven, N.Y.	-.06	115.3	.13	31	.78	.006	.010	
055a	Delaware, Ohio	-.06	40.6	.40	44	.04	.000	.019	
056a	Caldwell, Ohio	--	248.9	--	--	--	.333	--	
057a	Oxford, Ohio	-.06	43.3	.17	--	--	.000	.000	
058a	Wooster, Ohio	-.09	58.2	.31	46	.07	.000	.008	
063a	Kane, Pa.	--	186.5	--	--	--	.178	--	
064a	Leading Ridge, Pa.	-.10	34.5	.41	32	.03	.000	.036	
065a	Penn State, Pa.	-.09	51.3	.18	--	--	.000	.000	
075a	Parsons, W. Va.	-.07	38.7	.28	--	--	.000	.000	
143b	Longwoods, Ont.	-.08	31.5	.45	78	.05	.000	.000	
151a	Scranton, Pa.	-.12	88.3	.20	--	--	.000	.000	
153a	Zanesville, Ohio	-.04	48.6	.30	52	.08	.000	.000	
154a	Rockport, Ind.	--	62.9	--	--	--	.138	--	
156a	Fort Wayne, Ind.	-.06	73.2	.20	67	.06	.001	.022	
168a	Huntington, N.Y.	-.03	62.3	.13	60	.03	.012	.044	
176a	Colchester, Ont.	-.13	59.4	.41	51	.16	.000	.000	
177a	Merlin, Ont.	-.38	155.6	.13	--	--	.005	.013	
178a	Port Stanley, Ont.	-.09	56.1	.49	54	.16	.000	.000	
179a	Wilkesport, Ont.	-.40	77.4	.44	--	--	.000	.000	
180a	Alvinston, Ont.	-.17	47.8	.52	80	.07	.000	.025	
181a	Shallow Lake, Ont.	-.05	44.1	.37	47	.06	.000	.000	
182a	Palmerston, Ont.	-.04	65.0	.27	53	.10	.001	.009	
184a	Waterloo, Ont.	-.09	44.9	.46	57	.09	.000	.005	
187a	Uxbridge, Ont.	-.01	86.0	.12	79	.11	.028	.041	
189a	Campbellford, Ont.	-.10	39.7	.37	73	.03	.000	.000	
192a	Smiths Falls, Ont.	-.07	61.4	.36	38	.08	.000	.007	
221a	Melbourne, Ont.	-.11	43.7	.47	28	.05	.000	.031	
222a	North Easthope, Ont.	-.10	38.9	.29	--	--	.000	.000	
225a	Balsam Lake, Ont.	-.06	46.5	.33	62	.04	.000	.044	
228a	Railton, Ont.	-.06	47.4	.32	40	.05	.000	.014	
229a	Graham Lake, Ont.	--	180.6	--	--	--	.382	--	

[1] r^2 is the coefficient of determination of the regression between log of concentration and log of amount of precipitation.

[2] P-value is the smallest level of significance that would allow the null hypothesis to be rejected.

[3] S, seasonally adjusted model; P, precipitation-adjusted model; N, no model.

Table 7.--Description of seasonal and precipitation-related characteristics of statistical models for ammonium concentration

[--, no data]

Site ID	Station name	Slope	Standard error (pH units)	r^2 [1]	Peak day	Amplitude (ln units)	P-value[2] of model used	P-value[2] of comparison F-test	M u
025a	Indiana Dunes, Ind.	--	133.4	--	--	--	0.081	0.146	
032a	Kellogg, Mich.	-0.11	43.9	0.23	194	0.12	.010	.002	
033a	Wellston, Mich.	-.19	51.8	.35	188	.16	.000	.000	
040a	Aurora, N.Y.	-.13	43.3	.38	186	.19	.000	.000	
041a	Chautauqua, N.Y.	-.16	67.5	.10	--	--	.008	.019	
042a	Knobit, N.Y.	-.12	59.6	.41	196	.15	.000	.000	
043a	Whiteface, N.Y.	-.08	58.2	.24	206	.11	.000	.000	
044a	Ithaca, N.Y.	-.10	43.1	.46	200	.16	.000	.000	
045a	Stilwell Lake, N.Y.	-.09	53.6	.45	192	.10	.000	.000	
046a	Bennett Bridge, N.Y.	-.29	43.6	.33	--	--	.000	.000	
047a	Jasper, N.Y.	-.09	65.1	.32	179	.16	.000	.000	
048a	Brookhaven, N.Y.	-.12	69.9	.39	201	.15	.000	.000	
055a	Delaware, Ohio	--	81.0	--	--	--	.889	--	
056a	Caldwell, Ohio	-.09	44.3	.38	183	.13	.000	.000	
057a	Oxford, Ohio	-.10	48.5	.30	183	.15	.000	.000	
058a	Wooster, Ohio	-.14	47.5	.36	186	.21	.000	.000	
063a	Kane, Pa.	-.08	47.6	.24	191	.10	.000	.000	
064a	Leading Ridge, Pa.	-.09	47.2	.37	242	.18	.000	.000	
065a	Penn State, Pa.	-.10	47.7	.44	200	.19	.000	.000	
075a	Parsons, W. Va.	-.08	49.9	.28	185	.10	.000	.000	
143b	Longwoods, Ont.	-.16	35.4	.46	197	.21	.000	.000	
151a	Scranton, Pa.	-.05	77.0	.38	187	.21	.000	.000	
153a	Zanesville, Ohio	-.12	46.6	.41	186	.16	.000	.000	
154a	Rockport, Ind.	-.04	50.8	.30	177	.12	.035	.000	
156a	Fort Wayne, Ind.	-.13	43.1	.28	185	.15	.000	.000	
168a	Huntington, N.Y.	-.06	80.4	.14	178	.21	.008	.013	
176a	Colchester, Ont.	-.32	55.0	.40	183	.44	.000	.000	
177a	Merlin, Ont.	-.36	53.8	.43	199	.38	.000	.000	
178a	Port Stanley, Ont.	-.29	40.2	.49	186	.30	.000	.000	
179a	Wilkesport, Ont.	-.34	39.4	.46	198	.39	.000	.000	
180a	Alvinston, Ont.	-.45	56.0	.44	190	.33	.000	.000	
181a	Shallow Lake, Ont.	-.26	36.6	.38	169	.18	.000	.003	
182a	Palmerston, Ont.	-.35	36.9	.38	187	.26	.000	.000	
184a	Waterloo, Ont.	-.20	59.5	.26	169	.35	.000	.002	
187a	Uxbridge, Ont.	-.17	40.1	.42	188	.25	.000	.000	
189a	Campbellford, Ont.	-.18	43.8	.51	197	.39	.000	.000	
192a	Smiths Falls, Ont.	-.15	38.7	.56	206	.28	.000	.000	
221a	Melbourne, Ont.	-.18	33.4	.42	203	.16	.000	.000	
222a	North Easthope, Ont.	-.29	50.9	.26	213	.20	.001	.007	
225a	Balsam Lake, Ont.	-.40	67.0	.32	187	.13	.000	.000	
228a	Railton, Ont.	--	44.6	--	--	--	.102	--	
229a	Graham Lake, Ont.	--	47.2	--	--	--	.177	--	

[1] r^2 is the coefficient of determination of the regression between log of concentration and log of amount of precipitation.

[2] P-value is the smallest level of significance that would allow the null hypothesis to be rejected.

[3] S, seasonally adjusted model; P, precipitation-adjusted model; N, no model.

Table 8.--Description of seasonal and precipitation-related characteristics of statistical models for sodium concentration

[--, no data]

Site ID	Station name	Slope	Standard error (pH units)	r^2 [1]	Peak day	Amplitude (ln units)	P-value[2] of model used	P-value[2] of comparison F-test	Model used
025a	Indiana Dunes, Ind.	-0.06	126.1	0.19	29	0.07	0.004	0.029	S
032a	Kellogg, Mich.	--	164.9	--	--	--	.052	.350	N
033a	Wellston, Mich.	-.09	275.3	.27	--	--	.000	.000	P
040a	Aurora, N.Y.	-.08	126.0	.08	--	--	.011	.024	P
041a	Chautauqua, N.Y.	-.11	136.0	.12	--	--	.004	.009	P
042a	Knobit, N.Y.	-.07	79.5	.31	62	.06	.000	.010	S
043a	Whiteface, N.Y.	-.02	86.2	.10	101	.02	.001	.007	S
044a	Ithaca, N.Y.	-.03	83.9	.26	43	.03	.000	.000	S
045a	Stilwell Lake, N.Y.	--	102.8	--	--	--	.039	.051	N
046a	Bennett Bridge, N.Y.	-.08	69.2	.41	31	.05	.000	.000	S
047a	Jasper, N.Y.	-.05	114.1	.13	--	--	.003	.000	P
048a	Brookhaven, N.Y.	-.09	90.6	.14	30	.47	.004	.008	S
055a	Delaware, Ohio	-.05	99.3	.06	--	--	.017	.037	P
056a	Caldwell, Ohio	--	303.8	--	--	--	.576	--	N
057a	Oxford, Ohio	-.02	70.4	.07	--	--	.016	.034	P
058a	Wooster, Ohio	--	134.3	--	--	--	.110	--	N
063a	Kane, Pa.	-.09	126.2	.08	--	--	.015	.034	P
064a	Leading Ridge, Pa.	--	129.4	--	--	--	.147	--	N
065a	Penn State, Pa.	-.03	80.9	.08	--	--	.004	.001	P
075a	Parsons, W. Va.	--	126.4	--	--	--	.358	--	N
143b	Longwoods, Ont.	-.03	50.2	.09	--	--	.019	.040	P
151a	Scranton, Pa.	-.04	123.4	.18	39	.06	.003	.027	S
153a	Zanesville, Ohio	--	120.4	--	--	--	.082	--	N
154a	Rockport, Ind.	--	276.9	--	--	--	.105	--	N
156a	Fort Wayne, Ind.	-.02	87.6	.21	71	.04	.000	.004	S
168a	Huntington, N.Y.	-.07	97.3	.14	--	--	.001	.003	P
176a	Colchester, Ont.	-.03	101.5	.36	44	.13	.000	.000	S
177a	Merlin, Ont.	--	236.4	--	--	--	.034	.068	N
178a	Port Stanley, Ont.	-.03	80.0	.48	49	.10	.000	.000	S
179a	Wilkesport, Ont.	-.09	71.3	.50	52	.08	.000	.000	S
180a	Alvinston, Ont.	-.04	61.8	.49	68	.07	.000	.000	S
181a	Shallow Lake, Ont.	-.01	63.1	.45	43	.05	.000	.000	S
182a	Palmerston, Ont.	-.03	72.9	.30	58	.05	.000	.009	S
184a	Waterloo, Ont.	-.05	58.0	.54	65	.06	.000	.000	S
187a	Uxbridge, Ont.	-.02	132.2	.29	76	.09	.002	.006	S
189a	Campbellford, Ont.	-.02	51.4	.44	58	.05	.000	.000	S
192a	Smiths Falls, Ont.	-.04	90.3	.38	43	.08	.000	.000	S
221a	Melbourne, Ont.	-.04	58.4	.40	4	.04	.000	.000	S
222a	North Easthope, Ont.	--	68.0	--	--	--	.047	.094	N
225a	Balsam Lake, Ont.	--	82.7	--	--	--	.164	--	N
228a	Railton, Ont.	-.02	63.6	.22	35	.03	.005	.022	S
229a	Graham Lake, Ont.	--	286.6	--	--	--	.494	--	N

[1] r^2 is the coefficient of determination of the regression between log of concentration and log of amount of precipitation.

[2] P-value is the smallest level of significance that would allow the null hypothesis to be rejected.

[3] S, seasonally adjusted model; P, precipitation-adjusted model; N, no model.

Table 9.--Description of seasonal and precipitation-related characteristics of statistical models for potassium concentration
[--, no data]

Site ID	Station name	Slope	Standard error (pH units)	r^2 [1]	Peak day	Amplitude (ln units)	P-value [2] of model used	P-value [2] of comparison F-test	Model used
025a	Indiana Dunes, Ind.	-0.02	66.9	0.18	--	--	0.000	0.000	P
032a	Kellogg, Mich.	-.01	58.6	.34	193	0.01	.000	.000	S
033a	Wellston, Mich.	-.01	63.4	.14	--	--	.001	.004	P
040a	Aurora, N.Y.	-.01	81.2	.13	218	.01	.015	.002	S
041a	Chautauqua, N.Y.	--	271.9	--	--	--	.191	--	N
042a	Knobit, N.Y.	-.01	48.9	.31	161	.01	.000	.031	S
043a	Whiteface, N.Y.	--	128.3	--	--	--	.219	--	N
044a	Ithaca, N.Y.	-.01	101.6	.08	218	.01	.030	.043	S
045a	Stilwell Lake, N.Y.	-.01	53.0	.13	--	--	.004	.009	P
046a	Bennett Bridge, N.Y.	-.03	55.1	.27	--	--	.000	.000	P
047a	Jasper, N.Y.	-.01	73.1	.20	195	.01	.003	.007	S
048a	Brookhaven, N.Y.	-.05	118.3	.13	--	--	.000	.000	P
055a	Delaware, Ohio	--	201.2	--	--	--	.336	--	N
056a	Caldwell, Ohio	--	161.3	--	--	--	.824	--	N
057a	Oxford, Ohio	-.02	119.9	.07	--	--	.014	.031	P
058a	Wooster, Ohio	-.01	61.1	.17	194	.01	.002	.009	S
063a	Kane, Pa.	--	90.2	--	--	--	.080	--	N
064a	Leading Ridge, Pa.	--	60.9	--	--	--	.047	.066	N
065a	Penn State, Pa.	--	101.3	--	--	--	.132	--	N
075a	Parsons, W. Va.	-.01	64.7	.06	--	--	.018	.040	P
143b	Longwoods, Ont.	--	57.2	--	--	--	.297	--	N
151a	Scranton, Pa.	--	100.6	--	--	--	.110	--	N
153a	Zanesville, Ohio	--	199.3	--	--	--	.223	--	N
154a	Rockport, Ind.	--	100.9	--	--	--	.146	--	N
156a	Fort Wayne, Ind.	--	112.2	--	--	--	.871	--	N
168a	Huntington, N.Y.	-.01	60.0	.19	168	.01	.001	.009	S
176a	Colchester, Ont.	--	79.5	--	--	--	.080	--	N
177a	Merlin, Ont.	-.03	67.2	.19	197	.02	.010	.045	S
178a	Port Stanley, Ont.	-.03	78.2	.15	--	--	.006	.014	P
179a	Wilkesport, Ont.	-.06	80.1	.23	--	--	.000	.000	P
180a	Alvinston, Ont.	-.05	97.4	.10	--	--	.018	.038	P
181a	Shallow Lake, Ont.	--	70.3	--	--	--	.460	--	N
182a	Palmerston, Ont.	--	74.5	--	--	--	.141	--	N
184a	Waterloo, Ont.	--	113.5	--	--	--	.442	--	N
187a	Uxbridge, Ont.	--	76.4	--	--	--	.076	--	N
189a	Campbellford, Ont.	-.01	94.6	.22	205	.01	.001	.004	S
192a	Smiths Falls, Ont.	--	73.9	--	--	--	.343	--	N
221a	Melbourne, Ont.	--	68.2	--	--	--	.031	.061	N
222a	North Easthope, Ont.	--	82.3	--	--	--	.040	.057	N
225a	Balsam Lake, Ont.	--	126.3	--	--	--	.172	--	N
228a	Railton, Ont.	-.01	69.0	.47	244	.02	.024	.035	S
229a	Graham Lake, Ont.	--	88.1	--	--	--	.210	--	N

[1] r^2 is the coefficient of determination of the regression between log of concentration and log of amount of precipitation.

[2] P-value is the smallest level of significance that would allow the null hypothesis to be rejected.

[3] S, seasonally adjusted model; P, precipitation-adjusted model; N, no model.

Table 10.--Description of seasonal and precipitation-related characteristics of statistical models for calcium concentration

[--, no data]

Site ID	Station name	Slope	Standard error (pH units)	r^2 [1]	Peak day	Amplitude (ln units)	P-value [2] of model used	P-value [2] of comparison F-test	Model [3] used
025a	Indiana Dunes, Ind.	-0.41	162.7	0.08	--	--	0.023	0.046	P
032a	Kellogg, Mich.	-.16	53.0	.43	198	0.04	.000	.000	S
033a	Wellston, Mich.	-.36	89.5	.37	--	--	.000	.000	P
040a	Aurora, N.Y.	-.11	80.4	.22	164	.11	.000	.000	S
041a	Chautauqua, N.Y.	-.20	64.4	.37	--	--	.000	.000	P
042a	Knobit, N.Y.	-.10	68.2	.31	162	.08	.000	.006	S
043a	Whiteface, N.Y.	-.03	72.0	.17	191	.04	.000	.000	S
044a	Ithaca, N.Y.	-.08	47.4	.45	148	.05	.000	.000	S
045a	Stilwell Lake, N.Y.	-.07	59.6	.29	--	--	.000	.101	P
046a	Bennett Bridge, N.Y.	-.23	79.2	.25	--	--	.000	.000	P
047a	Jasper, N.Y.	-.07	83.5	.14	197	.09	.000	.007	S
048a	Brookhaven, N.Y.	-.05	57.2	.30	131	.04	.000	.000	S
055a	Delaware, Ohio	-.11	51.5	.33	185	.10	.000	.000	S
056a	Caldwell, Ohio	-.19	80.9	.24	200	.12	.000	.007	S
057a	Oxford, Ohio	-.05	63.8	.31	173	.10	.000	.000	S
058a	Wooster, Ohio	-.12	70.3	.17	195	.09	.001	.005	S
063a	Kane, Pa.	-.10	63.5	.22	158	.05	.000	.001	S
064a	Leading Ridge, Pa.	-.10	50.1	.30	178	.05	.000	.006	S
065a	Penn State, Pa.	-.11	56.9	.41	172	.07	.000	.000	S
075a	Parsons, W. Va.	-.14	62.1	.18	--	--	.000	.010	P
143b	Longwoods, Ont.	-.14	45.8	.34	196	.13	.000	.000	S
151a	Scranton, Pa.	-.07	68.1	.38	149	.05	.000	.000	S
153a	Zanesville, Ohio	-.09	60.0	.26	152	.09	.000	.000	S
154a	Rockport, Ind.	-.08	59.4	.36	183	.10	.000	.000	S
156a	Fort Wayne, Ind.	-.20	66.6	.31	150	.10	.000	.012	S
168a	Huntington, N.Y.	-.06	66.1	.19	174	.04	.001	.025	S
176a	Colchester, Ont.	-.28	62.7	.33	152	.26	.000	.000	S
177a	Merlin, Ont.	-.38	46.2	.44	128	.18	.000	.001	S
178a	Port Stanley, Ont.	-.44	69.2	.32	--	--	.000	.000	P
179a	Wilkesport, Ont.	-.31	45.6	.34	151	.19	.000	.018	S
180a	Alvinston, Ont.	-.20	66.2	.08	--	--	.042	.031	P
181a	Shallow Lake, Ont.	-.18	63.3	.33	169	.16	.000	.000	S
182a	Palmerston, Ont.	-.18	54.3	.33	130	.20	.000	.009	S
184a	Waterloo, Ont.	-.28	76.3	.22	171	.23	.010	.010	S
187a	Uxbridge, Ont.	--	75.2	--	--	--	.045	.051	N
189a	Campbellford, Ont.	-.17	50.1	.40	189	.32	.000	.000	S
192a	Smiths Falls, Ont.	-.15	62.8	.21	193	.17	.013	.016	S
221a	Melbourne, Ont.	-.17	68.2	.15	--	--	.004	.000	P
222a	North Easthope, Ont.	--	84.2	--	--	--	.041	.056	N
225a	Balsam Lake, Ont.	-.11	70.3	.34	176	.15	.000	.000	S
228a	Railton, Ont.	-.20	80.0	.23	--	--	.000	.000	P
229a	Graham Lake, Ont.	-.34	125.6	.17	--	--	.000	.000	P

[1] r^2 is the coefficient of determination of the regression between log of concentration and log of amount of precipitation.

[2] P-value is the smallest level of significance that would allow the null hypothesis to be rejected.

[3] S, seasonally adjusted model; P, precipitation-adjusted model; N, no model.

Table 11.--Description of seasonal and precipitation-related characteristics of statistical models for magnesium concentration

[--, no data]

Site ID	Station name	Slope	Standard error (pH units)	r^2 [1]	Peak day	Amplitude (ln units)	P-value [2] of model used	P-value [2] of comparison F-test	Model [3] used
025a	Indiana Dunes, Ind.	-0.09	178.5	0.07	--	--	0.029	0.001	P
032a	Kellogg, Mich.	-.05	66.0	.49	203	.03	.000	.000	S
033a	Wellston, Mich.	-.08	80.4	.40	--	--	.000	.000	P
040a	Aurora, N.Y.	-.02	67.7	.22	--	--	.003	.007	P
041a	Chautauqua, N.Y.	-.05	57.4	.43	--	--	.000	.000	P
042a	Knobit, N.Y.	-.02	83.6	.10	--	--	.014	.004	P
043a	Whiteface, N.Y.	--	79.6	--	--	--	.061	--	N
044a	Ithaca, N.Y.	-.01	47.9	.44	153	.01	.000	.000	S
045a	Stilwell Lake, N.Y.	-.01	56.6	.19	33	.02	.005	.032	S
046a	Bennett Bridge, N.Y.	-.05	92.2	.20	--	--	.000	.000	P
047a	Jasper, N.Y.	-.03	104.6	.18	--	--	.000	.000	P
048a	Brookhaven, N.Y.	--	93.8	--	--	--	.455	--	N
055a	Delaware, Ohio	-.03	44.9	.47	204	.02	.000	.000	S
056a	Caldwell, Ohio	-.03	65.1	.29	203	.02	.000	.003	S
057a	Oxford, Ohio	-.01	60.4	.26	167	.01	.000	.000	S
058a	Wooster, Ohio	-.02	57.4	.19	192	.01	.001	.015	S
063a	Kane, Pa.	-.02	77.3	.11	--	--	.004	.010	P
064a	Leading Ridge, Pa.	-.02	44.6	.27	203	.01	.000	.040	S
065a	Penn State, Pa.	-.01	68.3	.07	161	.01	.006	.003	S
075a	Parsons, W. Va.	-.02	46.3	.29	185	.01	.000	.027	S
143b	Longwoods, Ont.	-.02	48.6	.35	185	.02	.000	.000	S
151a	Scranton, Pa.	-.01	78.1	.20	120	.01	.001	.030	S
153a	Zanesville, Ohio	-.01	60.2	.26	162	.01	.000	.000	S
154a	Rockport, Ind.	--	62.0	--	--	--	.210	--	N
156a	Fort Wayne, Ind.	-.05	87.2	.23	--	--	.000	.000	P
168a	Huntington, N.Y.	-.01	64.4	.10	--	--	.004	.010	P
176a	Colchester, Ont.	-.10	66.2	.39	151	.07	.000	.006	S
177a	Merlin, Ont.	-.08	81.4	.15	--	--	.004	.011	P
178a	Port Stanley, Ont.	-.11	91.3	.27	--	--	.000	.000	P
179a	Wilkesport, Ont.	-.06	51.6	.26	--	--	.000	.000	P
180a	Alvinston, Ont.	-.05	72.0	.28	121	.05	.001	.012	S
181a	Shallow Lake, Ont.	-.05	71.8	.34	175	.03	.000	.007	S
182a	Palmerston, Ont.	-.06	66.0	.34	125	.06	.000	.006	S
184a	Waterloo, Ont.	-.07	87.2	.20	164	.06	.014	.000	S
187a	Uxbridge, Ont.	-.03	69.3	.38	180	.06	.000	.000	S
189a	Campbellford, Ont.	-.03	63.8	.48	194	.05	.000	.000	S
192a	Smiths Falls, Ont.	--	82.6	--	--	--	.213	--	N
221a	Melbourne, Ont.	-.03	65.5	.16	--	--	.003	.009	P
222a	North Easthope, Ont.	--	64.2	--	--	--	.137	--	N
225a	Balsam Lake, Ont.	-.02	77.6	.38	187	.03	.000	.000	S
228a	Railton, Ont.	--	62.3	--	--	--	.048	.090	N
229a	Graham Lake, Ont.	-.07	128.8	.22	--	--	.001	.003	P

[1] r^2 is the coefficient of determination of the regression between log of concentration and log of amount of precipitation.

[2] P-value is the smallest level of significance that would allow the null hypothesis to be rejected.

[3] S, seasonally adjusted model; P, precipitation-adjusted model; N, no model.

Relations of Ion Concentration and pH to Season

The day of the year on which the highest pH value or ion concentration is expected to occur at a site is the peak day for that constituent. Peak-day values are calculated and reported as a Julian day. Peak days for ion concentrations and pH occur in two distinct seasons, summer and winter. The Julian-day numbers associated with peak days for pH, chloride, and sodium occur early in the year, in winter, whereas the Julian-day numbers associated with peak days for other ions occur in the middle of the year in late spring and summer (tables 3-11). Peak days for pH are days when maximum pH (minimum acidity) is expected to occur. For pH, these were less than the day 45 at all 25 sites in the study area for which there was a significant seasonal component. At 14 sites, peak days for pH values occurred in January (from day 1 through day 31). The days of minimum pH (most acidic precipitation) occurred from early July through mid-August (from day 183 through day 227). Sodium and chloride were the only other chemical constituents for which peak days occurred in winter (from day 4 through day 101).

The second group of peak days occurred in midyear, from May through August (from day 120 through day 242). Peak days for nitrate, calcium, potassium, and magnesium all occurred from early May through mid-July (from day 120 through day 200). Most of the peak days for sulfate and ammonium occurred later than for the other chemical constituents. Peak days for sulfate ranged from late June through early August (from day 181 through day 217), nearly concurrent with the time span when pH can be expected to be at its minimum. Peak days for ammonium occurred from late June through late August (from day 179 through day 242). The relation between season and potassium concentration was weak or absent at many sites; however, important seasonal effects can be seen at most sites for nitrate, ammonium, calcium, and sulfate. The most significant regression coefficients for the seasonal components and the most sites with significant seasonal effects were noted for sulfate.

The amplitudes of the seasonal-concentration change are highest for sulfate, nitrate, ammonium, and pH. The amplitudes for sodium, potassium, calcium, and magnesium are smaller than those for the anions, ammonium, and pH.

Temporal Trends in Ion Concentration and pH

Statistical and Graphical Methods Used

The Seasonal Kendall test (Hirsch and others, 1982) is a distribution-free test that incorporates a modified form of Kendall's tau statistic to determine whether a monotonic trend over time is present in a data set. The use of distribution-free statistics allows the investigator to test for trend under a less restrictive set of conditions than would be required for parametric approaches (Crawford and others, 1983). The Seasonal Kendall test was used because the precipitation-chemistry data in this study could be serially correlated, exhibits considerable seasonality, and might not be normally distributed.

The Seasonal Kendall test compares all possible pairs of data values in increasing chronological order. If the later of two values is the higher, a plus is recorded, and if the later value is the lower, a minus is recorded. If no trend exists in the data, the probability of a given value being higher or lower than the previous value is 0.5. If the number of pluses greatly exceeds the number of minuses, the values in the series are increasing with time, and an uptrend is indicated. For monthly data, January data are compared only with January data and so on (Crawford and others, 1983). The result is a computation of the statistic tau and a slope estimator. The slope estimator is taken to be the median of the slopes of the ordered pairs of data compared in the test.

The Seasonal Kendall test was used to determine whether the concentrations and the regression residuals (from the regressions of the natural logs of concentrations and amounts of precipitation) show a significant temporal trend. Because the regression relation between transformed concentrations and amount of precipitation was not significant at some sites, trend tests were not always done for regression residuals. At many sites, precipitation was not a significant explanatory variable until it was combined with the sine and cosine terms in the seasonal model. Data for each chemical constituent and physical property was tested for trend at α=0.05.

The temporal patterns in concentrations and regression residuals can be visualized by means of a time-series scatterplot. Because the range of the concentrations of ions dominates the visual impression of the data, a line of central tendency or "smooth" was used to draw attention to the center. Smoothing is used only to reveal patterns in the data, and no significance tests can be applied to the technique.

Locally weighted scatterplot smoothing (LOWESS) is a technique that involves the use of robust-weighted least-squares regression (Cleveland, 1979; Cleveland and McGill, 1984). At each value x, a predicted value y is computed from a weighted least-squares regression. Regression residuals from the first smoothed series are calculated and used for the second smoothed series; observations with large regression residuals in the previous iteration are thus given reduced weight in the next (Schertz and Hirsch, 1985). A smoothness factor is used to determine the number of points that influence the magnitude of the smoothed y value. A smoothness factor (f) of 0.6 (in years) was used for the purposes of this study. A value (from the robust regression) used in the smooth will receive a small weight and will therefore have little effect on the smoothed value of y if it is either far in distance from x or corresponds to a large regression residual from the previous regression.

Temporal Trends in Ion Concentration and pH

Tests for temporal trends in concentrations and regression residuals of chemical constituents, pH, and amount of precipitation were completed for 42 sites in the study area for which a minimum of 5 years of data were available (tables 15-23, at back of report; figs. 20-28). An uptrend in an ion concentration, precipitation value, or a related regression residual indicates that an increase has occurred over the period of record. For pH, an uptrend indicates a decrease in the acidity of precipitation over time. A trend in ion concentration or pH represents a change over time that is unadjusted for the effects of amount of precipitation. A trend in the regression residuals of an ion concentration or pH represents a change over time that has been adjusted to compensate for (remove) the effects of amount of precipitation. Therefore, time trends in regression residuals are better indicators of changes in precipitation chemistry than are the original concentration or pH data because variability due to precipitation has been removed. Trends in ion concentrations, pH, and their regression residuals are reported for comparative purposes. Table 12 is a summary of results of trend tests for all 42 precipitation-chemistry data-collection sites.

Very few uptrends in concentrations or regression residuals were detected; however, uptrends in pH were detected at 19.0 percent of all sites, and uptrends in pH regression residuals were [Adetected at 26.7 percent of the sites. One uptrend was detected in nitrate concentration (2.4 percent of all sites). No uptrends were detected for any other chemical constituents.

Downtrends in the regression residuals and concentrations were more common than uptrends. A downtrend in an ion-concentration time series, or regression-residual time series, indicates a decline in ion concentration over the period of record. Downtrends in sulfate were detected at more sites than were downtrends for any other constituent. Downtrends in sulfate concentration were detected at 47.6 percent of all sites, and downtrends in regression residuals were detected at 43.8 percent of all sites. Downtrends in sulfate concentrations and regression residuals indicate an improvement in precipitation chemistry at approximately 40 to 50 percent of all sites. Downtrends for sodium, potassium, calcium, magnesium, and chloride were detected in concentrations at 16.7 to 38.1 percent of all sites and in regression residuals at 10.5 to 35.3 percent of all sites. Downtrends in cations may not necessarily signal an improvement in precipitation chemistry.

The fewest downtrends in concentrations and regression residuals were detected for nitrate and ammonium. Downtrends for nitrate were detected in concentrations at 7.1 percent of all sites and in regression residuals at 5.0 percent of all sites. Downtrends for ammonium were detected in concentrations at 7.1 percent of all sites and in regression residuals at 38.9 percent of all sites.

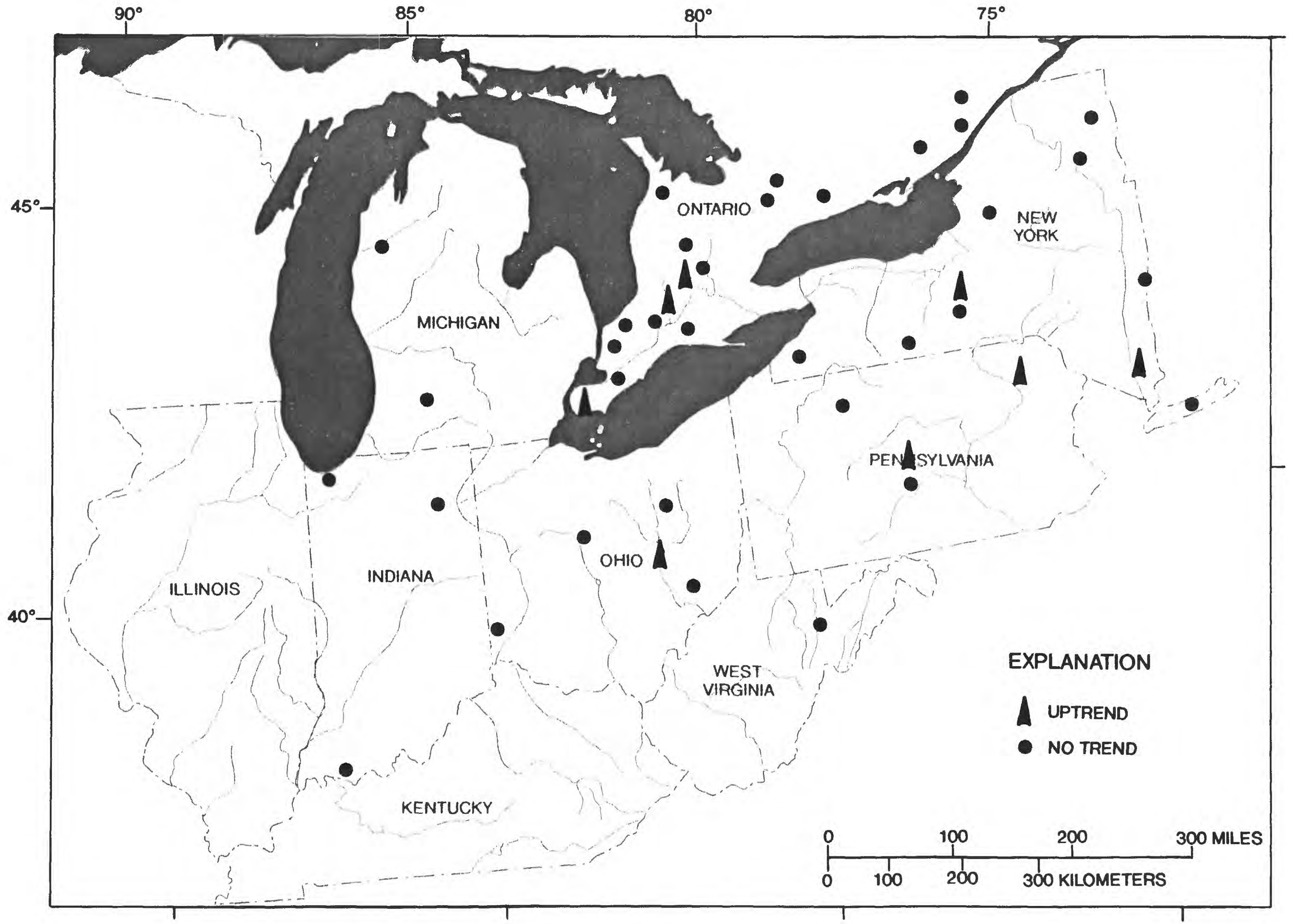


Figure 20.--Trends in pH values for sites having at least five years of data from 1977 through 1985.

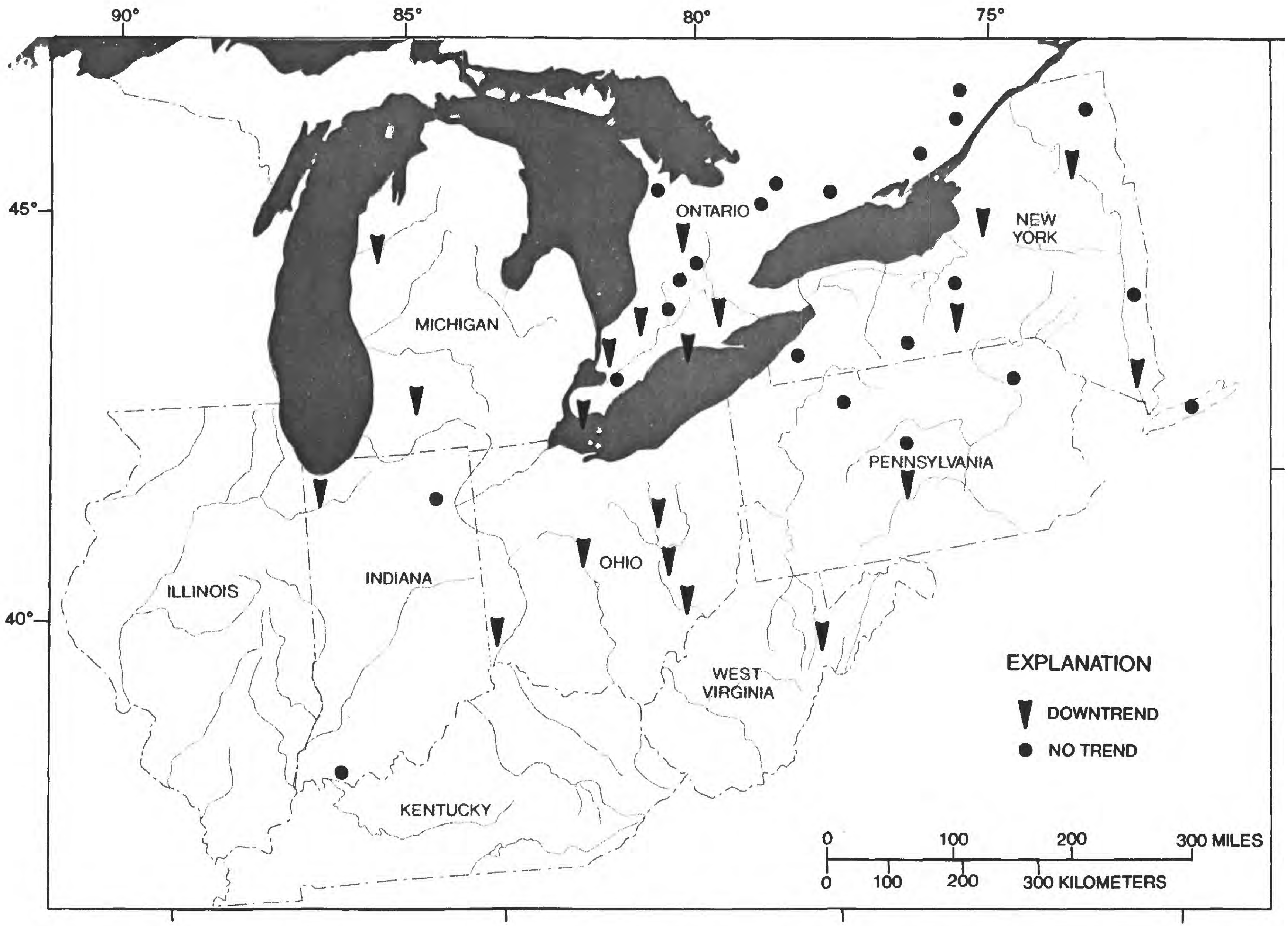


Figure 21.--Trends in sulfate concentrations for sites having at least five years of data from 1977 through 1985.

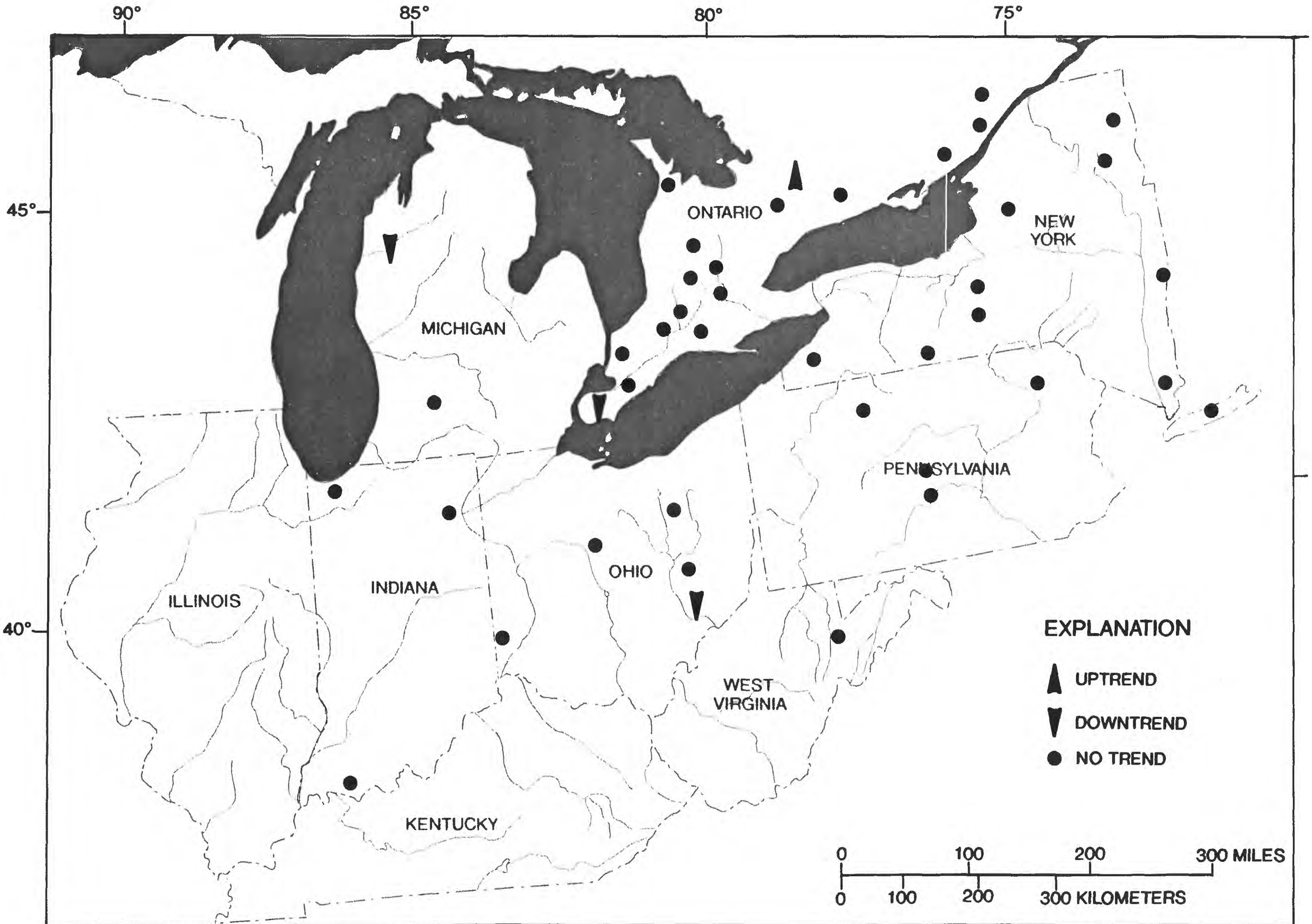


Figure 22.--Trends in nitrate concentrations for sites having at least five years of data from 1977 through 1985.

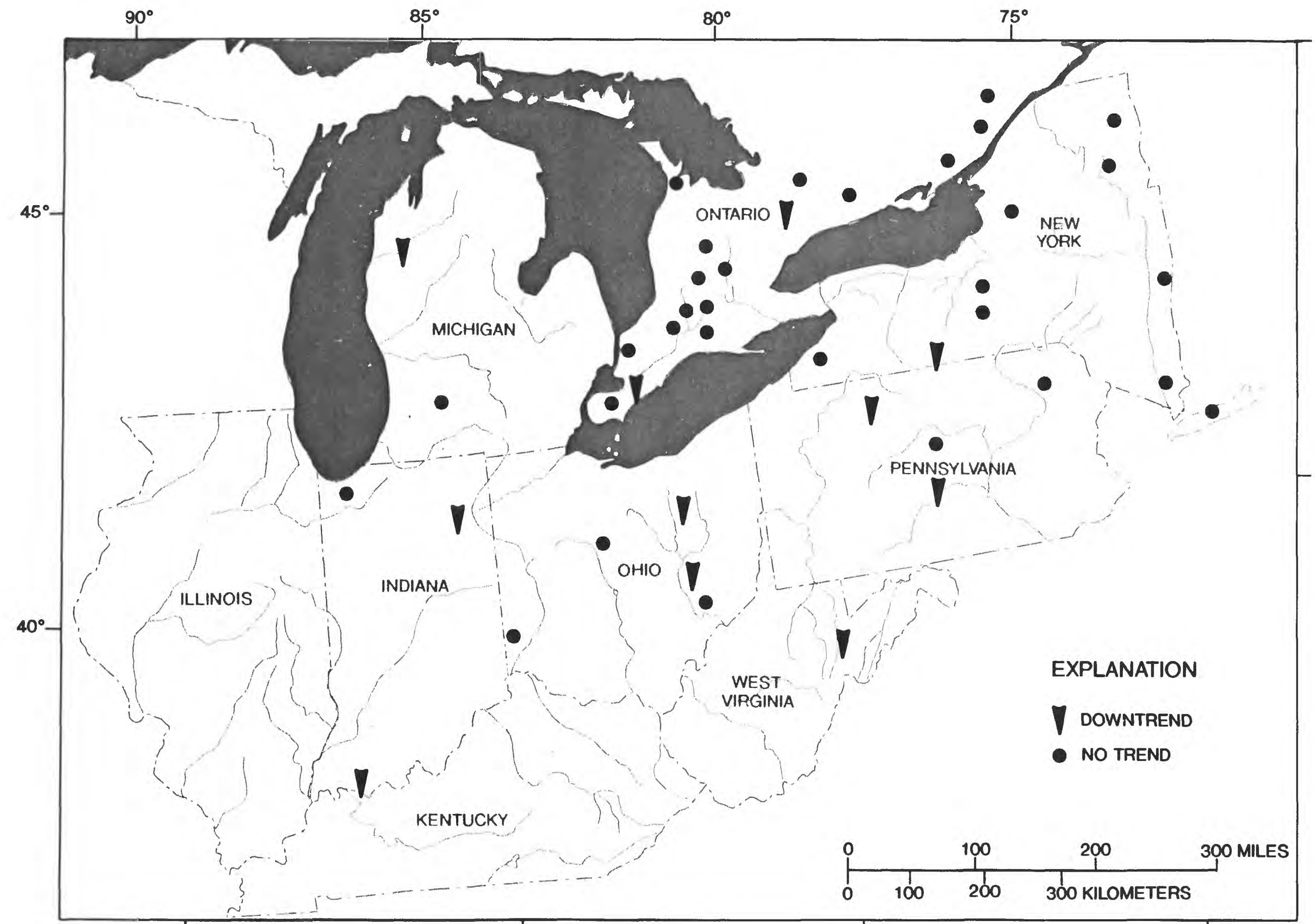


Figure 23.--Trends in chloride concentrations for sites having at least five years of data from 1977 through 1985.

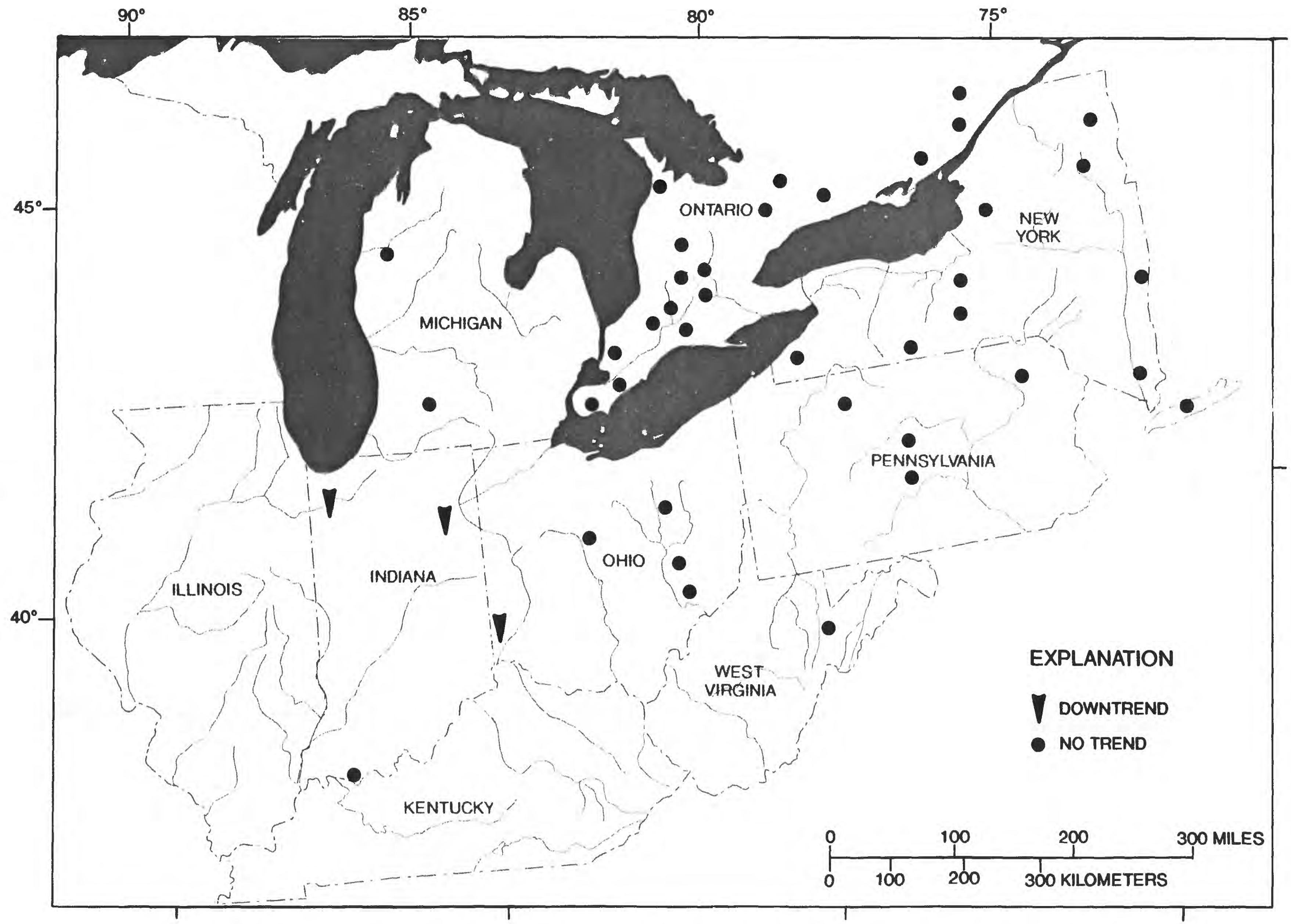


Figure 24.--Trends in ammonium concentrations for sites having at least five years of data from 1977 through 1985.

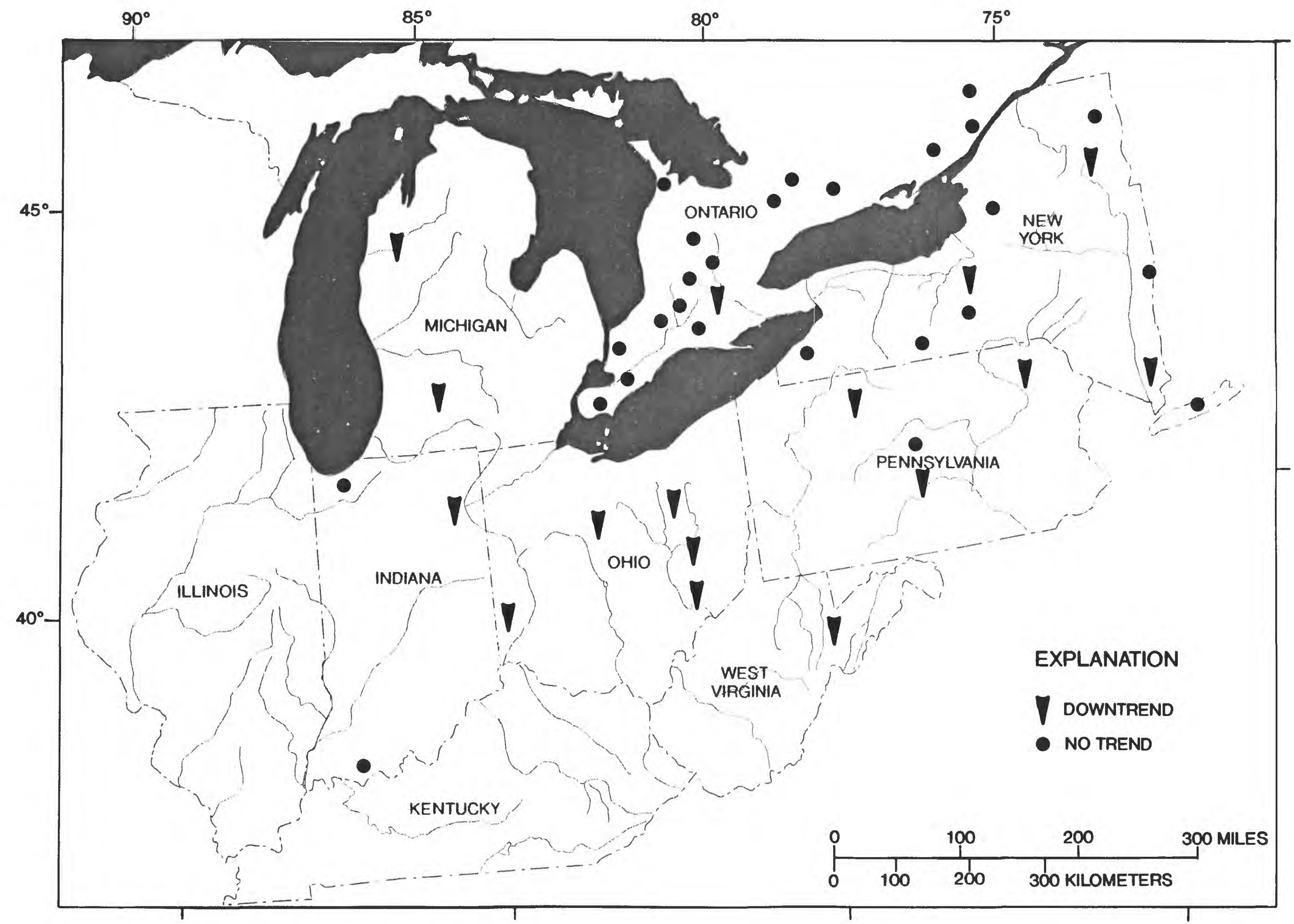


Figure 25.--Trends in sodium concentrations for sites having at least five years of data from 1977 through 1985.

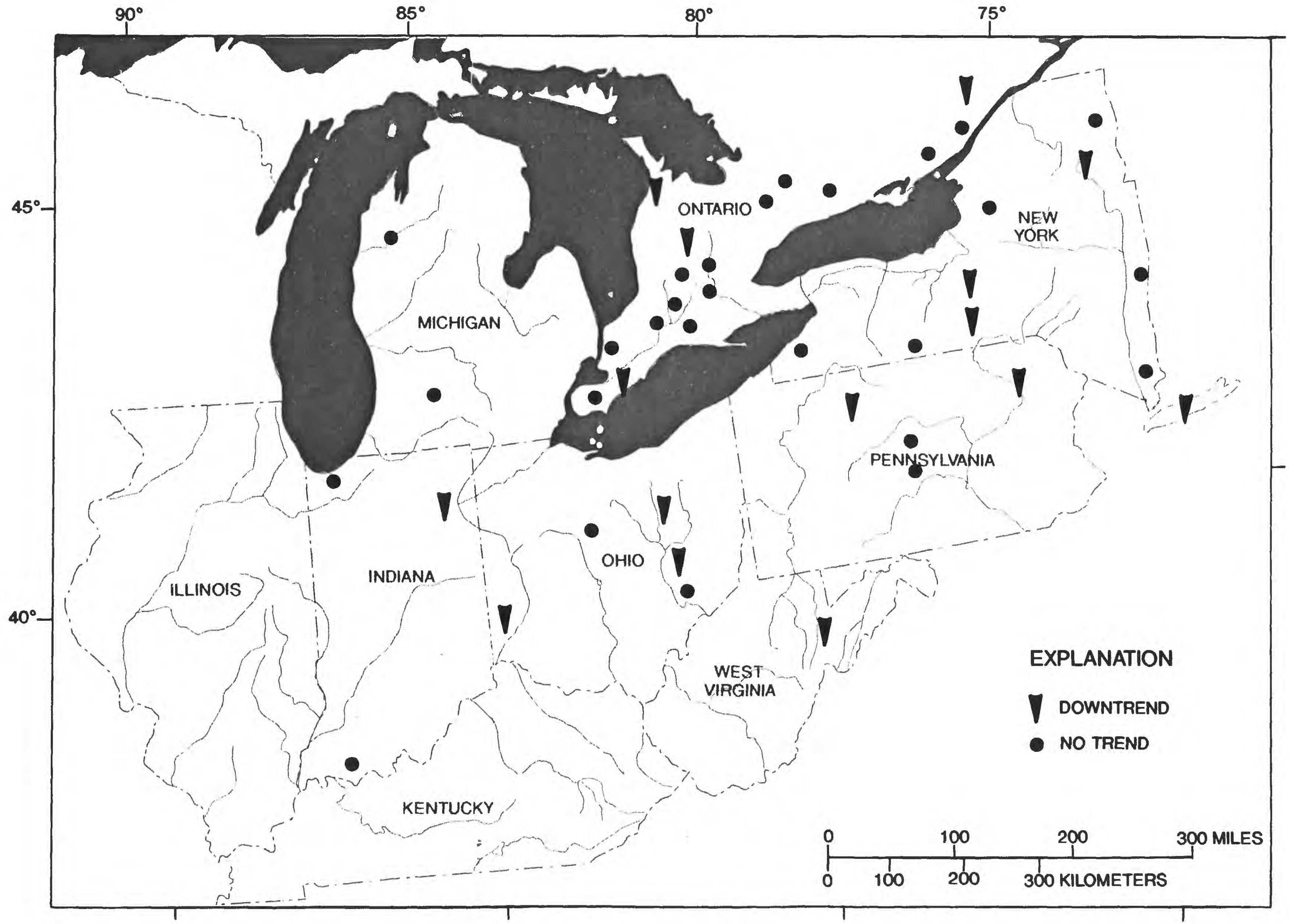


Figure 26.--Trends in potassium concentrations for sites having at least five years of data from 1977 through 1985.

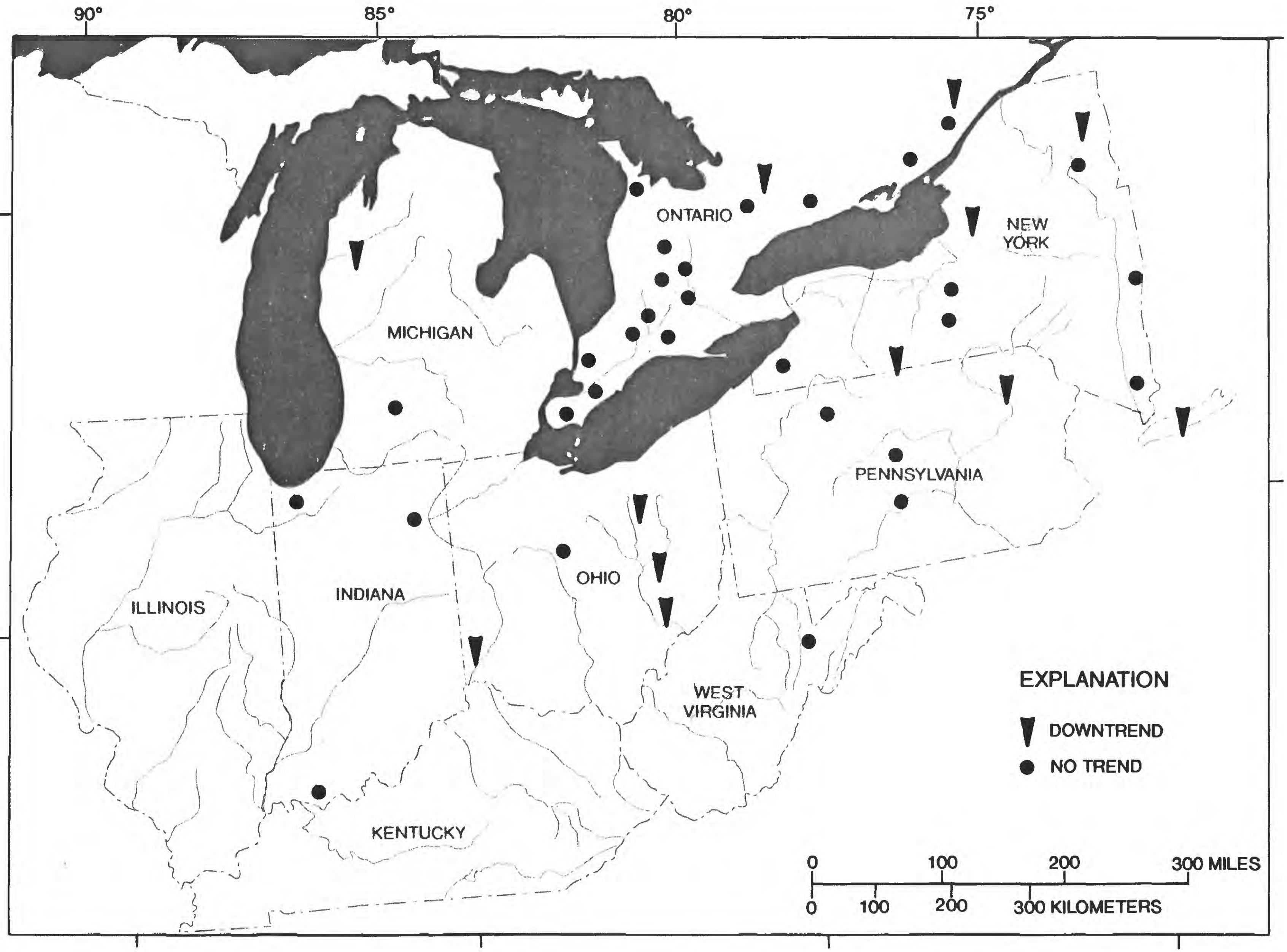


Figure 27.--Trends in calcium concentrations for sites having at least five years of data from 1977 through 1985.

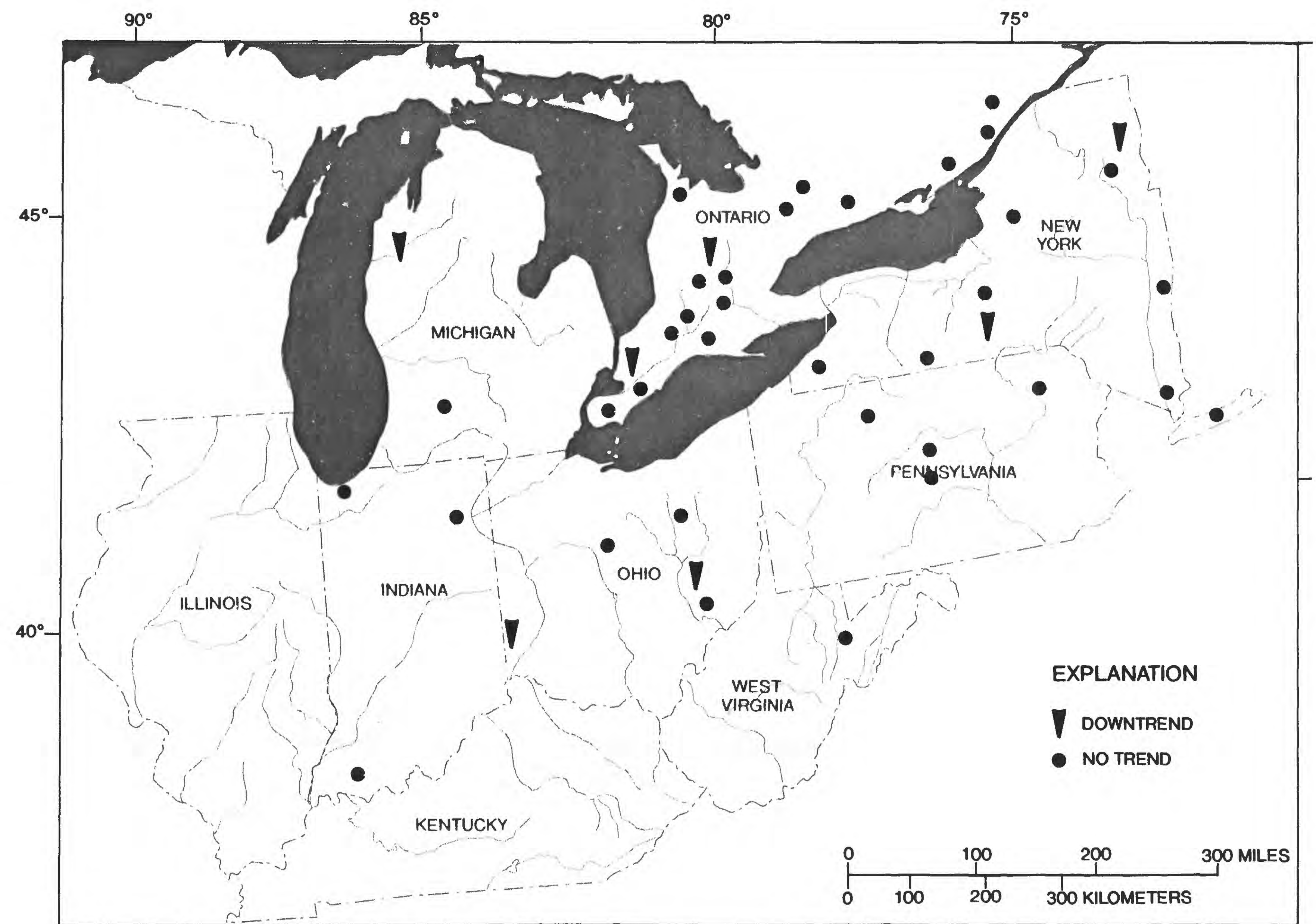


Figure 28.--Trends in magnesium concentrations for sites having at least five years of data from 1977 through 1985.

Table 12.--Summary of trends in pH, ion concentrations, and regression residuals at precipitation-chemistry data-collection sites

[No., number; %, percent]

Properties and constituents	Uptrend				Downtrend				No change			
	Concentrations		Residuals[1]		Concentrations		Residuals[1]		Concentrations		Residuals[1]	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
pH	8	19.0	4	26.7	0	0.0	0	0.0	34	81.0	11	73.3
Sulfate	0	0.0	0	0.0	20	47.6	7	43.8	22	52.4	9	52.9
Nitrate	1	2.4	1	2.5	3	7.1	2	5.0	38	95.0	37	92.5
Chloride	0	0.0	0	0.0	11	26.3	2	10.5	31	73.8	17	89.5
Ammonium	0	0.0	0	0.0	3	7.1	7	38.9	39	92.9	16	61.1
Sodium	0	0.0	0	0.0	16	38.1	5	23.8	26	61.9	16	76.2
Potassium	0	0.0	0	0.0	15	35.7	3	14.3	27	64.3	18	85.7
Calcium	0	0.0	0	0.0	12	28.6	12	35.3	30	71.4	22	64.7
Magnesiumn	0	0.0	0	0.0	7	16.7	5	15.2	35	83.3	28	84.8
Totals	9	2.4	5	1.3	88	23.3	43	19.4	281		174	

[1] Represents the number of sites with models that were significant at $\alpha=0.05$ for the relation between the logarithm of pH or ion concentration and amount of precipitation.

Most of the changes in precipitation chemistry over time occurred in Ohio, Pennsylvania, New York, and Ontario. An exception was ammonium, for which downtrends were detected only in Indiana and western Ohio. The most obvious pattern of decreasing concentration was detected for sulfate. Downtrends (improvements) in sulfate concentrations were detected at all five sites in Ohio. Uptrends (improvements) in pH were most common in Ohio, Pennsylvania, New York, and southern Ontario.

Downtrends in sulfate could be partly reflected by similar uptrends in pH. Uptrends in pH, however, may not occur at each site for which a downtrend in sulfate occurs because of the reactions between hydrogen ion and the other cations with nitrate and sulfate ions in precipitation.

Sulfate and nitrate are the primary inorganic anions that contribute to the acidification of rain (Albritton and others, 1987). Because of their importance in atmospheric chemistry, they were examined in additional detail. Time series of scatterplots and their respective LOWESS lines for concentrations and regression residuals of sulfate and nitrate are shown for each of 42 sites (figs. 29-70 for sulfate and figs. 71-112 for nitrate; see the "Supplemental Data" section). For each site, time-series plots of concentrations and regression residuals are placed on the same page for comparison. The regression residuals may be either seasonally adjusted or precipitation adjusted or both, depending on the model used.

The LOWESS lines assist in visual interpretation of the movement of the center of the data. The most obvious pattern in the plots of sulfate concentration is the seasonal oscillation of values at all sites, the highest concentrations occurring during summer and lowest during winter. This seasonal pattern has been attributed to relatively low rates of photochemical oxidation of sulfur dioxide to sulfuric acid in winter as compared with summer (Calvert and others, 1985). This pattern corroborates the results of the seasonally adjusted model.

The scatterplots and LOWESS lines for sulfate residuals reveal a very different pattern from the one observed for concentrations. For most sites, the seasonal pattern has been removed or greatly reduced. For 35 of the 42 sites, smaller or negative sulfate residuals are found for 1982-84 than for 1976-81. At 18 sites, this pattern of smaller or negative regression residuals persists through 1985; at 17 sites, the residual values increase during late 1984 and 1985. Time-series values of regression residuals that are progressively smaller than their predecessors would indicate decreasing concentrations with time.

The pattern revealed in the LOWESS lines for sulfate agrees with the results of the Seasonal Kendall test, which detected downtrends for sulfate concentrations and regression residuals at approximately 40 to 50 percent of the sites. The predominance of downtrends over uptrends, and the near equality in number of sites with downtrends as compared with no trends, agrees with the overall results for tests on sulfate in precipitation samples reported by Schertz and Hirsch (1985) and Barchet (1987).

The scatterplots and LOWESS lines of nitrate concentrations do not show as strong a seasonal pattern as that observed for sulfate concentrations; the amplitudes of the annual peaks for nitrate, when they occur, are usually smaller and less well defined. For some sites, this lack of seasonal pattern is the result of missing data. A seasonal nitrate pattern is evident for 27 of the 42 sites.

A pattern that is similar between the plots of sulfate- and nitrate-regression residuals is the predominance of smaller and (or) negative residuals at 30 of 42 sites during 1982-84. At 29 of these 30 sites, residuals are positive after 1984. This pattern is reflected in the Seasonal Kendall trend tests on concentrations and regression residuals for nitrate. Only one significant downtrend and only one significant uptrend were found in the study area. Results of trend tests on nitrate residuals at nearly all sites agreed not only with results of tests on nitrate concentrations but also with the graphical presentation of these results in the scatterplots.

UTILITY OF A COMBINED DATA BASE FOR DESCRIBING PRECIPITATION CHEMISTRY IN THE UPPER OHIO RIVER VALLEY AND LOWER GREAT LAKES REGION

Use of a combined data base for evaluation of precipitation chemistry had several benefits. The number of sites available for areal and temporal analysis were far greater, even under the conditions imposed on the data, than would have been if only a one or a few networks were used. Of a total of 114 sites from 13 precipitation-chemistry data-collection networks, data from 70 sites were combined into a common set for mapping of ion concentrations, data from 54 sites were combined for mapping of ion deposition, and data from 42 sites were combined for determining seasonal changes and temporal trends.

The precipitation-weighted monthly mean values used to describe the chemistry of precipitation in this study are consistent with the results of other studies during the mid-1980's indicating that Ohio, Pennsylvania, western New York, and southern Ontario are areas of relatively greater deposition of acidic materials in precipitation compared to other northeastern States and provinces. However, the availability of many sites in this study resulted in maps with somewhat greater areal definition than those provided by studies based on data from one or two networks.

The use of long-term average (multiyear) values rather than annual average (1-year) values for ion deposition results in improved representation of long-term-average conditions.

Sites in the study area represented a variety of land uses and emission conditions. Some sites were in rural areas of the Midwest or in forested areas of New York and Pennsylvania and were regional in representation, whereas others were close to major urban areas and industrial sources and were not regional in representation. However, the study area as a whole is representative of a region with some of the highest sulfate and nitrate emissions in the Nation (Placet and Streets, 1987).

The precipitation-chemistry relations developed from the combined data base used in this study indicate broad areal and temporal patterns for most ions investigated. The areal patterns in precipitation chemistry determined in this study indicate that source areas (areas that are sources of emissions that produce acid rain) could have similar or worse precipitation chemistry than receptor areas (areas only receiving acid rain). This conclusion would not be so apparent if this study were limited to data from only one or two networks. The most obvious patterns in ion concentration and ion deposition were gradients for sulfate that increased toward the study area's center and gradients of nitrate and most cations that increased from south to north. These gradients appeared to be independent of network and site-location characteristics. If additional sites that are representative of the local environment of emission sources had been available, it might have been possible to delineate subregional patterns that could be related to changes in specific emission sources.

The precipitation-chemistry data in this report cannot be used to answer questions regarding source-receptor relations because no information is presented on processes such as transport distance (the distance of travel between source and receptor). Transport distance defines the region of influence of a particular source (Schwartz, 1989). Therefore, this data analysis does not provide the type of information that would be needed to relate changes in specific emission sources with areal or temporal changes in precipitation chemistry.

On a broader scale, however, the number of downtrends in sulfate concentrations found in precipitation could be related to an overall 21-percent decrease in sulfate emissions from Illinois, Indiana, Kentucky, Michigan, Missouri, Ohio, Pennsylvania, Tennessee, and West Virginia from 1975 through 1985 (Placet and Streets, 1987). Emissions in Michigan and Kentucky have declined the most; concurrently, the greatest number of downtrends in sulfate concentrations over a similar period were found in Ohio, Michigan, and southwestern Ontario. Reductions in sulfur emmissions in the States bordering the Great Lakes and Saint Lawrence River (Illinois, Indiana, Maine, Michigan, Minnesota, New Hampshire, New York, Ohio, Pennsylvania, Vermont, and Wisconsin), which might affect emission patterns in Ontario, also dropped 20 percent from 1975 through 1985 (Placet and Streets, 1987). Emissions of sulfur dioxide in the states bordering the Great Lakes are thought to influence emission and deposition patterns in Canada (Placet and Streets, 1987).

The no-trend pattern in nitrate concentrations and regression residuals could be related to opposing effects of emission trends for gasoline-powered automobiles as compared to those for trucks and powerplants. Although automobile emissions of nitrogen oxides decreased by 25 percent nationwide from 1975 through 1984, powerplant emissions increased. Powerplant emissions of nitrogen oxides increased by 33 percent from 1975 through 1985. From 1976 through 1983, nitrogen dioxide emissions decreased by 10 percent nationwide but then increased slightly from 1983 through 1985 (Knudson, 1986).

The data analysis in this report provides a static, fixed-time (1976-85) estimate of regional-scale areal and temporal patterns in precipitation chemistry. Other processes such as dry deposition and cloud- and fog-water impaction are not addressed, but they are equally important or more important in terms of the total amount of atmospheric deposition of acid materials (Schwartz, 1989).

The continued operation of the precipitation-chemistry data-collection networks examined in this study will enable future investigators to make use of progressively larger data sets. As the length of record for these sites increases and the data-collection sites become better defined, data from most of the 114 sites in this study area will become suitable for statistical analysis. Most of the sites not selected for analysis in this study are in the United States; and when these data become available in ADS, they will greatly enhance the representation of States such as West Virginia and Kentucky, for which no data or data from only one or two sites were used to analyze precipitation chemistry.

SUMMARY

A detailed analysis of the areal and temporal patterns in precipitation chemistry in the upper Ohio River Valley and lower Great Lakes region was formulated from data combined from 13 independent precipitation-chemistry data-collection networks. Networks were evaluated by use of five criteria before data were accepted for statistical analysis. These criteria included availability of data in the Acid Deposition System, documentation of quality-assurance and quality-control practices, use of documented and accepted field and laboratory methods and practices, defined site-location characteristics, and analysis for a common set of constituents. The evaluation resulted in the selection of seven networks for the analysis of pH and concentrations and deposition of hydrogen ion, sulfate, nitrate, chloride, ammonium, sodium, potassium, calcium, magnesium, and amount of precipitation. Data were available for 70 sites for which summary statistics of ion concentrations and pH were computed, 54 sites for which summary statistics of ion deposition were computed, and 42 sites for which seasonal and temporal trends of ion concentrations and pH values were computed. For ion concentrations, statistical analyses were performed on precipitation-weighted monthly mean (PWMM) ion concentrations (or pH values). For ion deposition, statistical analyses were based on monthly ion-deposition values.

The highest mean PWMM ion concentrations and lowest pH values in the study area were found at sites in the area bounded by eastern Ohio, Pennsylvania, western New York, and southern Ontario. Mean PWMM pH values in the study area ranged from 4.18 in eastern Ohio to 4.45 in northwestern Indiana. Mean PWMM sulfate concentrations ranged from 1.9 mg/L in western Indiana to 5.4 mg/L in southern Ontario. The highest concentrations of mean PWMM nitrate, chloride, ammonium, calcium, and magnesium in the study area were found at sites in southern Ontario.

Areal patterns in monthly mean sulfate deposition were similar to the patterns found in concentration. Compared to other parts of the study area, deposition of hydrogen and sulfate ions was greatest in eastern Ohio, Pennsylvania, western New York, and southern Ontario. The monthly mean hydrogen ion deposition in this area ranged from 2.5 and 7.5 mg/m^2 compared to concentrations that were two to three times lower outside this area. The range of monthly mean sulfate deposition was 3 to 5 g/m^2 in Ohio, Pennsylvania, western New York, and southern Ontario, whereas the monthly mean sulfate deposition was from 2 to 3 g/m^2 in other parts of the study area. The areal pattern of monthly mean nitrate deposition was similar to concentration patterns. Monthly mean nitrate and ammonium deposition appear to increase from south to north in the study area. Within the study area, the greatest nitrate and ammonium deposition is in southern Ontario. Areal patterns in monthly mean calcium and magnesium deposition were similar to concentration patterns. The largest monthly mean deposition values for both were in southern Ontario, where values were two to four times higher for calcium and two to three times higher for magnesium than at most sites outside Ontario.

Scatterplots of PWMM ion concentrations and monthly amounts of precipitation at most sites showed a curvilinear pattern of increasing concentrations with decreasing amounts of precipitation. Ordinary least-squares linear regression was used to quantify an inverse relation between PWMM concentrations and pH values and monthly amounts of precipitation by use of a natural-log transformation of both variables. The regression coefficients for the slope of the line relating concentrations to precipitation were negative, and in decreasing order were steepest for nitrate and sulfate, followed by ammonium, calcium, and chloride. The slopes for sodium, potassium, and magnesium generally were less than 0.1, which indicates that amount of precipitation has a significant but very small effect on the monthly mean concentrations of these three cations. Overall, the slopes of the regression lines describing the relation between PWMM ion concentrations (or pH values) and amount of precipitation found in this study were smaller than those determined by Schertz and Hirsch (1985) from regressions of weekly concentration values and volume of precipitation.

The standard errors for most regression equations ranged from 50 to 100 percent or higher, which indicates these statistical models cannot predict with much certainty the concentrations of ions and pH in precipitation for any given month. The standard errors of estimate for sulfate and nitrate regressions were in the range of approximately 35 to 50 percent, respectively.

The coefficents of determination or r^2 values in this report generally were less than 0.5. The highest r^2 values were noted for sulfate and nitrate as compared to the other ions, with some models having values greater than 0.50. As a group, the cations had the lowest r^2 values.

The effect of season on PWMM ion concentrations and pH was measured by adding seasonal terms to the simple regression model of ion concentration or pH against amount of precipitation. Seasonal effects were significant at most sites for sulfate, nitrate, ammonium, calcium, and pH. The relation between season and precipitation chemistry was the strongest for sulfate; whereas the relation between season and precipitation chemistry was the weakest for potassium.

The coefficients of the seasonal terms were used to calculate the peak day in the year and the amplitude of the peak for log-transformed ion concentrations. Peak days from May through mid-July (from day 120 through day 200) were found for nitrate, calcium, potassium, and magnesium. The peak days for sulfate and ammonium occurred later than for the other ions. The peak days for sulfate were in the period from late June through July (from day 181 through 217). Peak days for pH, sodium, and chloride occurred early in the year.

The Seasonal Kendall test was used to determine whether pH and ion concentrations and their regression residuals (from the simple regression of PWMM concentrations and amount of precipitation) are characterized by a significant time trend. Because the regression relation between concentration values and amount of precipitation was not significant for some sites, trend tests were not always performed for regression residuals. Data for each chemical constituent and physical property was tested for trend at α=0.05.

Tests for trends in PWMM ion concentrations, pH, and regression residuals were done for sites having a minimum of 5 years of data. Very few uptrends in ion concentrations and regression residuals were detected. Uptrends (improvements) in pH values were detected at 19.0 percent of all sites. Uptrends in pH regression residuals were detected at 26.7 percent of the sites. One uptrend was detected for nitrate concentrations (2.4 percent of all sites). No uptrends were detected for any other ions.

Downtrends in the regression residuals and ion concentrations were more commonly detected than uptrends. A downtrend in an unadjusted concentration, pH value, or regression residual indicates that a decrease in PWMM values has occurred over the time period of observations. Downtrends (improvements) in sulfate were detected most frequently; for sulfate concentrations at 47.6 percent of all sites and for regression residuals at 43.8 percent of all sites. Downtrends in ion concentrations of sodium, potassium, calcium, magnesium, and chloride were detected at 16.7 to 38.1 percent of all sites and in regression residuals at 10.5 to 35.3 percent of all sites.

The fewest downtrends in concentrations and regression residuals were detected for nitrate and ammonium. Downtrends in nitrate concentrations were detected at only 7.1 percent of all sites and in regression residuals at only 5.0 percent of all sites. Downtrends in ammonium concentrations were detected at 7.1 percent of all sites and in regression residuals at 38.9 percent of all sites.

Most of the changes in precipitation chemistry over time occurred in Ohio, Pennsylvania, western New York, and southern Ontario. An exception was ammonium, for which downtrends were detected only for Indiana and western Ohio. Downtrends in sulfate concentrations were detected at all five sites examined for Ohio. Uptrends in pH were detected most frequently for Ohio, Pennsylvania, New York, and southern Ontario.

The PWMM values used to describe the precipitation chemistry in this report support the results of other recent studies indicating that Ohio, Pennsylvania, western New York, and southern Ontario are major areas of deposition of acidic materials in precipitation. However, the addition of many more sites in this study produced maps with somewhat greater areal resolution that those provided by studies based on one or two networks.

The data analysis in this report provides a "snapshot" of areal and temporal patterns in regional-precipitation chemistry. Other sources such as dry deposition and cloud- and fog-water are not addressed, but they may be equally or more important in estimating the total amount of atmospheric deposition of acid materials (Schwartz, 1989).

REFERENCES CITED

Albritton, D., Fehsinfeld, F., Hicks, B., Miller, J., Liu, S., Hales, J., Shannon, J., Durham, J., and Patrinos, A., 1987, Atmospheric processes: National Acid Precipitation Assessment Program, v. III, chap. 4, p. 4-1 to 4-81.

Barchet, W.R., 1987, Acidic deposition and its gaseous precursors: National Acid Precipitation Assessment Program, v. III, chap. 5, p. 5-39 to 5-83.

Barrie, L.A., and Hales, J.M., 1984, The spatial distributions of precipitation acidity and major ion wet deposition in North America during 1980: Tellus, v. 36B, p. 333-355.

Box, G.E., and Jenkins, G.M., 1976, Time series analysis forecasting and control: Oakland, Calif., Holden-Day, p. 301-303.

Calvert, J.G., Lazrus, A., Kok, G.L., Heikes, B. B., Walega, J.G., Lind, J. and Cantrell, C.A., 1985, Chemical mechanisms of acid generation in the troposphere: Nature, v. 317, p. 27-35.

Childress, C.J.O., Chaney, T.H., Myers, D.N., Norris, M.J., and Hren, Janet, 1989, Water-quality data-collection activities in Colorado and Ohio--Phase II, Evaluation of 1984 field and laboratory quality-assurance practices: U.S. Geological Survey Water Supply Paper 2295-B, p. B1-B29.

Cleveland, W.S., 1979, Robust locally weighted regression and smoothing scatterplots: Journal of the American Statistical Association, no. 74, p. 829-836.

Cleveland, W.S., and McGill, R., 1984, The many faces of a scatterplot: Journal of the American Statistical Association, no. 79, p. 807-822.

Crawford, C.G., Slack, J.R., and Hirsch, R.M., 1983, Nonparametric tests for trends in water-quality data using the Statistical Analysis System: U.S. Geological Survey Open-File Report 83-550, 102 p.

Dana, M.T., and Easter, R.C., 1987, Statistical summary and analyses of event precipitation chemistry from the MAP3S network, 1976-83: Atmospheric Environment, v. 21, p. 113-128.

Draper, N.R., and Smith, H., 1981, Applied regression analysis: New York, Wiley, p. 305-310.

Friedman, L.C., and Erdmann, D.E., 1982, Quality assurance practices for the chemical and biological analyses of water and fluvial sediments: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 5, Chap. A6, 181 p.

Gatz, D.F., Bowersox, V.C., Su, I., and Strensland, G.J., 1987, Great Lakes Atmospheric Deposition (GLAD) network, 1982 and 1983--data analysis and interpretation: Great Lakes National Program Office, U.S. Environmental Protection Agency, EPA-905/4-88-002, no. 2, p. 1-69.

Hirsch, R.M., Slack, J.R., and Smith, R.A., 1982, Techniques of trend analysis for monthly water-quality data: Water Resources Research, v. 18, no. 1, p. 107-121.

Hren, J., Chaney, T.H., Norris, M.J., and Childress, C.J.O., 1987, Water-quality data-collection activities in Colorado and Ohio--Phase 1,-Inventory and evaluation of 1984 programs and costs: U.S. Geological Survey Water Supply Paper 2295-A, 71 p.

Knudson, D.A., 1986, Estimated monthly emmissions of sulfur dioxide and oxides of nitrogen of the 48 contiguous states, 1975-1984: Argonne National Laboratory Report ANL/EES-0TM-318, v. 1 and 2.

Olsen, A.R., and Slavich, A.L., 1986, Acid precipitation in North America--1984 annual data summary from Acid Deposition System Data Base: U.S. Environmental Protection Agency, EPA/600/4-86/033, p. 3.1-3.12.

Peden, M.E., Bachman, S.R., Brennan, C.J., Demir, B., James, K.O., Kaiser, B. W., Lockard, J. M., Rothert, J. E., Sauer, J., Skowron, L.M., and Slater, M.I., 1986, Development of standard methods for the collection and analysis of precipitation: U.S. Environmental Protection Agency, EPA 600/4-86/024, p. 1-21.

Peters, N.E., and Bonelli, J.E., 1982, Chemical composition of h bulk precipitation in the north-central and northeastern United States, December 1980 through February 1981: U.S. Geological Survey Circular 874, 63 p.

Peters, N.E., Schroeder, R.A., and Troutman, D.E., 1982, Temporal trends in the acidity of precipitation and surface waters of New York: U.S. Geological Survey Water-Supply Paper 2188, 35 p.

Placet, M., and Streets, D.G., 1987, Emissions of acidic deposition precursors: National Acid Precipitation Assessment Program, v. I, chap. 1, p. I-30 to I-31.

Schertz, L., and Hirsch, R.M., 1985, Trend analysis of weekly acid-rain data--1978-83. U.S. Geological Survey Water-Resources Investigations Report 85-4211, p. 33-40.

Schroder, L.J., Brooks, M.H., Garbarino, J.R., and Willoughby, T.C., 1987, The influence of an urban environment in the chemical composition of precipitation, in Chemical Quality of Water and the Hydrologic Cycle: Chelsea, Mich., Leives Publishers, p. 40-53.

Schwartz, S.E., 1989, Acid deposition--unravelling a regional phenomenon: Science, v. 243, p. 753-763.

Smith, R.A., Alexander, R.B., and Wolman, M.G., 1987, Water-quality trends in the Nation's rivers: Science, v. 235, p. 1607-1615.

Strensland, G.J., Whelpdale, D.M., and Oehlert, G., 1986, Precipitation chemistry, in Acid deposition--long-term trends: Washington, D.C., National Research Council, p. 128-199.

Tew, E.L., and Eaton, W.C., 1986, Siting criteria for urban-influenced wet deposition collection sites: Research Triangle Park, N.C., U.S. Environmental Protection Agency, 5 p.

SUPPLEMENTAL DATA

Table 13.--Summary statistics for precipitation-weighted monthly mean pH and ion concentrations from precipitation-chemistry data-collection sites for which 1 or more years of data are available

[ug/L, micrograms per liter; mg/L, milligrams per liter; cm, centimeter]

Property or Constituent (Unit)	Summary Statistics: Sample Size	Maximum	Minimum	Mean	Percentage of Samples in which Values Were Less than or Equal to Those Shown: 95	75	Median 50	25	5
Station Number 025a Station Name Indiana Dunes, Ind.									
LAB PH	66	6.53	3.87	4.4453	4.8515	4.5700	4.4100	4.2600	3.9810
HYDROGEN ION (ug/L)	66	133.61	.3	43.6453	103.836	55.4125	38.9450	26.9050	14.2655
SULFATE (mg/L)	66	27.03	1.18	3.6677	6.3390	4.1875	3.0300	2.3475	1.7010
NITRATE (mg/L)	66	25.2	.87	2.3205	4.0265	2.3225	1.9000	1.4075	1.0135
CHLORIDE (mg/L)	66	3.46	.06	.2658	.5055	.2600	.1800	.1400	.0735
AMMONIUM (mg/L)	66	5.71	.13	.5114	.8425	.5400	.4100	.2800	.2000
SODIUM (mg/L)	66	1.301	.023	.1211	.2660	.1302	.0905	.0562	.0277
POTASSIUM (mg/L)	66	.205	.009	.0386	.0847	.0480	.0315	.0227	.0113
CALCIUM (mg/L)	66	8.32	.07	.6052	1.2745	.6350	.4100	.2675	.1005
MAGNESIUM (mg/L)	66	1.937	.021	.1284	.2576	.1377	.0885	.0537	.0274
TOTAL PRECIPITATION (cm)	66	25	1.6	8.1076	19.0850	10.2000	7.7000	3.9000	1.8000
Station Number 032a Station Name Kellogg, Mich.									
LAB PH	78	5.39	3.87	4.3600	4.6905	4.4500	4.3400	4.2375	4.0400
HYDROGEN ION (ug/L)	78	134.91	4.04	48.0141	90.5310	57.2500	45.7200	35.4425	20.3965
SULFATE (mg/L)	78	10.77	.7	3.2123	5.1650	3.8425	2.9750	2.3775	1.4000
NITRATE (mg/L)	78	5.85	.77	2.2238	4.1860	2.5100	2.0350	1.6850	1.2745
CHLORIDE (mg/L)	78	.62	.06	.1778	.3985	.2200	.1500	.1000	.0795
AMMONIUM (mg/L)	78	1.05	.01	.4410	.9805	.5300	.4350	.2975	.1485
SODIUM (mg/L)	78	1.548	.022	.1883	1.0628	.1325	.0815	.0480	.0260
POTASSIUM (mg/L)	78	.174	.009	.0295	.0590	.0342	.0255	.0177	.0129
CALCIUM (mg/L)	78	1.32	.05	.3003	.7400	.3550	.2600	.1850	.1095
MAGNESIUM (mg/L)	78	.486	.012	.0642	.1349	.0730	.0535	.0357	.0229
TOTAL PRECIPITATION (cm)	79	20.4	.6	7.6253	14.9000	10.5000	6.9000	4.2000	1.7000
Station Number 033a Station Name Wellston, Mich.									
LAB PH	78	5.08	4.06	4.4260	4.7160	4.5525	4.4150	4.3000	4.1200
HYDROGEN ION (ug/L)	78	86.69	8.32	41.1056	75.5125	50.2200	38.5950	28.2475	19.4190
SULFATE (mg/L)	78	17.65	.42	2.8717	6.4250	3.2100	2.4900	1.8150	.9195
NITRATE (mg/L)	78	10.54	.87	2.2776	4.0725	2.7025	1.9350	1.5025	1.0560
CHLORIDE (mg/L)	78	1.22	.05	.2141	.7910	.2225	.1500	.1000	.0695
AMMONIUM (mg/L)	78	1.31	.01	.4272	1.0015	.5050	.3650	.2600	.0895
SODIUM (mg/L)	78	7.394	.018	.3650	1.9354	.1230	.0685	.0400	.0248
POTASSIUM (mg/L)	78	.12	.004	.0316	.0769	.0382	.0250	.0190	.0110
CALCIUM (mg/L)	78	2.95	.05	.3217	.7475	.3425	.2300	.1700	.0800
MAGNESIUM (mg/L)	78	.577	.013	.0776	.2501	.0915	.0520	.0365	.0219
TOTAL PRECIPITATION (cm)	86	19.6	.3	8.0640	16.6050	10.3500	7.8500	5.8000	2.4000

Table 13.--Summary statistics for precipitation-weighted monthly mean pH and ion concentrations from precipitation-chemistry data-collection sites for which 1 or more years of data are available--Continued

Property or Constituent (Unit)	Summary Statistics: Sample Size	Summary Statistics: Maximum	Summary Statistics: Minimum	Summary Statistics: Mean	Percentage of Samples in which Values Were Less than or Equal to Those Shown: 95	75	Median 50	25	5
Station Number 040				Station Name Indiana Dunes, Ind.					
LAB PH	81	5.14	3.73	4.2133	4.5890	4.3400	4.2200	4.0600	3.8460
HYDROGEN ION (ug/L)	81	188.13	7.28	68.6773	141.547	87.6550	60.7800	45.5650	25.5450
SULFATE (mg/L)	81	9.99	.87	3.5840	6.6800	4.7800	3.1900	2.2500	1.3660
NITRATE (mg/L)	81	6.07	.54	2.3809	4.3570	2.8400	2.2000	1.6700	1.0550
CHLORIDE (mg/L)	81	.77	.06	.2140	.5650	.2200	.1800	.1400	.1000
AMMONIUM (mg/L)	81	1.24	.06	.4007	.7190	.5050	.3800	.2450	.1000
SODIUM (mg/L)	81	1.141	.019	.1251	.5151	.1340	.0710	.0445	.0281
POTASSIUM (mg/L)	81	.137	.005	.0290	.0831	.0325	.0230	.0150	.0090
CALCIUM (mg/L)	81	1.14	.04	.2215	.6150	.2400	.1600	.1150	.0800
MAGNESIUM (mg/L)	81	.196	.013	.0475	.1496	.0500	.0380	.0270	.0171
TOTAL PRECIPITATION (cm)	81	17.5	1.1	7.1160	14.8500	9.7500	6.4000	4.2500	2.4000
Station Number 041a				Station Name Chautauqua, N.Y.					
LAB PH	67	4.8	3.67	4.2082	4.4900	4.3400	4.2300	4.0700	3.8620
HYDROGEN ION (ug/L	67	215.26	15.78	68.5866	137.468	85.3700	58.5500	45.2900	32.5780
SULFATE (mg/L)	67	9.22	1.55	3.5479	6.9380	4.2800	3.3500	2.2800	1.7000
NITRATE (mg/L)	67	13.26	.88	2.4588	5.0120	2.6700	1.9700	1.6200	1.1460
CHLORIDE (mg/L)	67	1.07	.08	.2536	.8400	.2700	.1900	.1400	.0940
AMMONIUM (mg/L)	67	1.74	.01	.4182	.8980	.5000	.3600	.2200	.1200
SODIUM (mg/L)	67	1.3	.018	.1279	.3970	.1410	.0700	.0420	.0274
POTASSIUM (mg/L)	67	1.513	.008	.0680	.1726	.0550	.0310	.0200	.0104
CALCIUM (mg/L)	67	1.38	.06	.2407	.6120	.2900	.1900	.1300	.0700
MAGNESIUM (mg/L)	67	.197	.012	.0554	.1822	.0690	.0410	.0290	.0190
TOTAL PRECIPITATION (cm)	67	24.9	1.5	8.9836	18.2400	11.3000	8.5000	5.9000	2.2800
Station Number 042a				Station Name Knobit, N.Y.					
LAB PH	59	5	3.73	4.3571	4.8600	4.5500	4.3400	4.1800	3.9500
HYDROGEN ION (ug/L)	59	187.82	9.89	51.8612	111.64	66.5500	45.6400	28.0000	13.6800
SULFATE (mg/L)	59	7.59	.53	2.4666	5.4000	3.3300	2.1100	1.3100	.7600
NITRATE (mg/L)	59	5.51	.55	1.9617	4.5200	2.2900	1.6200	1.2700	.6000
CHLORIDE (mg/L)	59	1.13	.07	.2171	.6000	.2600	.1700	.1100	.0800
AMMONIUM (mg/L)	59	.94	.02	.2464	.5400	.3300	.2200	.1100	.0300
SODIUM (mg/L)	59	.641	.024	.1269	.3920	.1560	.0860	.0570	.0300
POTASSIUM (mg/L)	59	.085	.005	.0257	.0670	.0310	.0240	.0150	.0090
CALCIUM (mg/L)	59	.73	.03	.1686	.5700	.2100	.1300	.0900	.0400
MAGNESIUM (mg/L)	59	.291	.01	.0474	.1250	.0560	.0370	.0240	.0150
TOTAL PRECIPITATION (cm)	67	25.3	1.2	7.8851	15.8800	10.6000	7.6000	4.2000	2.0000

Table 13.--Summary statistics for precipitation-weighted monthly mean pH and ion concentrations from precipitation-chemistry data-collection sites for which 1 or more years of data are available--Continued

Property or Constituent (Unit)	Summary Statistics: Sample Size	Maximum	Minimum	Mean	Percentage of Samples in which Values Were Less than or Equal to Those Shown: 95	75	Median 50	25	5
Station Number 043a				Station Name Whiteface, N.Y.					
LAB PH	108	4.86	3.89	4.3484	4.6265	4.4775	4.3500	4.2425	4.0625
HYDROGEN ION (ug/L)	108	130.29	13.8	48.8834	86.8515	57.1700	44.7700	33.4600	23.5755
SULFATE (mg/L)	111	6.01	.35	2.1068	4.3140	2.8800	1.8700	1.2100	.7120
NITRATE (mg/L)	111	4.54	.39	1.4552	2.6940	1.5900	1.3100	1.0900	.6260
CHLORIDE (mg/L)	111	.61	.01	.1514	.3840	.1700	.1200	.0900	.0500
AMMONIUM (mg/L)	111	1	.02	.2419	.5200	.3300	.2100	.1200	.0560
SODIUM (mg/L)	106	.292	0	.0480	.1424	.0570	.0370	.0230	.0083
POTASSIUM (mg/L)	105	.324	.008	.0461	.1934	.0500	.0250	.0150	.0080
CALCIUM (mg/L)	101	.52	.01	.0906	.2100	.1200	.0700	.0500	.0200
MAGNESIUM (mg/L)	100	.073	.003	.0160	.0436	.0200	.0120	.0080	.0050
TOTAL PRECIPITATION (cm)	111	21.2	1.2	8.1901	17.1200	10.1000	7.7000	5.1000	2.3200
Station Number 043b				Station Name Whiteface, N.Y.					
LAB PH	17	4.85	4.1	4.3741	4.8500	4.5500	4.3200	4.1850	4.1000
HYDROGEN ION (ug/L)	17	79.1	13.97	46.5194	79.1000	65.8050	48.2900	28.1850	13.9700
SULFATE (mg/L)	17	3.92	.68	2.1235	3.9200	3.3950	1.6200	1.0750	.6800
NITRATE (mg/L)	17	3.98	.22	1.5424	3.9800	1.9850	1.3500	.9100	.2200
CHLORIDE (mg/L)	17	.17	.02	.0829	.1700	.1150	.0800	.0500	.0200
AMMONIUM (mg/L)	17	1.01	.02	.2588	1.0100	.3450	.1700	.0950	.0200
SODIUM (mg/L)	17	.107	.015	.0436	.1070	.0700	.0340	.0215	.0150
POTASSIUM (mg/L)	17	.08	.005	.0238	.0800	.0285	.0180	.0105	.0050
CALCIUM (mg/L)	17	.52	.04	.1094	.5200	.1250	.0600	.0400	.0400
MAGNESIUM (mg/L)	17	.071	.008	.0248	.0710	.0310	.0170	.0135	.0080
TOTAL PRECIPITATION (cm)	18	17.4	3.4	9.4333	17.4000	11.8500	9.7500	4.8000	3.4000
Station Number 044a				Station Name Ithaca, N.Y.					
LAB PH	104	4.63	3.64	4.1885	4.4700	4.3175	4.1800	4.0700	3.8875
HYDROGEN ION (ug/L)	104	226.73	23.38	70.5650	129.2	85.2625	66.3100	48.1150	34.1900
SULFATE (mg/L)	110	10.75	.48	2.9007	5.6340	3.9525	2.5250	1.4700	1.1500
NITRATE (mg/L)	110	6.9	.55	2.0872	3.6035	2.4875	1.9150	1.5625	.9955
CHLORIDE (mg/L)	110	1.25	.01	.2185	.5345	.2625	.1700	.1200	.0700
AMMONIUM (mg/L)	110	.87	.03	.2945	.6435	.4000	.2750	.1575	.0700
SODIUM (mg/L)	106	.391	.004	.0572	.1580	.0707	.0405	.0245	.0083
POTASSIUM (mg/L)	106	.239	.004	.0324	.1078	.0380	.0220	.0140	.0080
CALCIUM (mg/L)	101	.44	.01	.1235	.2890	.1750	.1100	.0700	.0210
MAGNESIUM (mg/L)	100	.068	.004	.0198	.0448	.0247	.0170	.0110	.0050
TOTAL PRECIPITATION (cm)	111	20.2	.2	8.4532	17.2200	10.6000	7.9000	5.5000	2.6200

Table 13.--Summary statistics for precipitation-weighted monthly mean pH and ion concentrations from precipitation-chemistry data-collection sites for which 1 or more years of data are available--Continued

Property or Constituent (Unit)	Summary Statistics: Sample Size	Maximum	Minimum	Mean	Percentage of Samples in which Values Were Less than or Equal to Those Shown: 95	75	Median 50	25	5
Station Number 045a				Station Name Stilwell Lake, N.Y.					
LAB PH	63	4.74	3.77	4.2900	4.6540	4.4600	4.3100	4.1400	3.8820
HYDROGEN ION (ug/L)	63	169.64	18.19	58.5321	131.474	72.1800	49.4400	34.4500	22.1300
SULFATE (mg/L)	63	7.63	.88	2.6976	6.0940	3.4000	2.3900	1.6700	1.1280
NITRATE (mg/L)	63	3.84	.62	1.7670	3.5600	2.3900	1.5500	.9800	.6620
CHLORIDE (mg/L)	63	2.47	.04	.4475	1.5140	.4300	.3000	.1900	.0860
AMMONIUM (mg/L)	63	.74	.03	.1965	.4580	.2800	.1700	.0800	.0400
SODIUM (mg/L)	63	1.318	.031	.2670	.9444	.2610	.1800	.1020	.0442
POTASSIUM (mg/L)	63	.092	.008	.0245	.0496	.0300	.0210	.0160	.0100
CALCIUM (mg/L)	63	.59	.04	.1351	.3360	.1700	.1100	.0700	.0420
MAGNESIUM (mg/L)	63	.175	.019	.0545	.1338	.0680	.0440	.0310	.0204
TOTAL PRECIPITATION (cm)	64	33.4	1.4	11.3078	24.1500	15.6750	10.4000	5.8500	2.1250
Station Number 046a				Station Name Bennett Bridge, N.Y.					
LAB PH	64	4.91	3.68	4.2308	4.5175	4.3900	4.2400	4.0900	3.8825
HYDROGEN ION (ug/L)	64	210.47	12.34	66.1978	131.517	80.9350	57.4000	40.6875	30.5325
SULFATE (mg/L)	64	9.69	1.05	3.3152	6.3800	4.5200	2.9050	2.0025	1.3250
NITRATE (mg/L)	64	12.84	.74	2.5750	5.3725	2.9950	2.1900	1.6900	.9975
CHLORIDE (mg/L)	64	1.12	.01	.2075	.4775	.2375	.1700	.1300	.0600
AMMONIUM (mg/L)	64	1.26	.05	.4331	.8075	.5650	.3850	.2625	.1450
SODIUM (mg/L)	64	.566	.012	.0921	.2295	.1217	.0720	.0442	.0245
POTASSIUM (mg/L)	64	.15	.006	.0366	.0677	.0437	.0310	.0225	.0110
CALCIUM (mg/L)	64	1.16	.04	.2295	.6825	.2975	.1700	.1100	.0550
MAGNESIUM (mg/L)	64	.315	.007	.0524	.2010	.0627	.0365	.0260	.0162
TOTAL PRECIPITATION (cm)	67	26.6	2.9	10.5597	18.3600	13.2000	10.2000	7.1000	4.3200
Station Number 047a				Station Name Jasper, N.Y.					
LAB PH	65	4.71	3.77	4.3240	4.6880	4.5000	4.3200	4.1750	3.9200
HYDROGEN ION (ug/L)	65	170.36	19.35	53.5212	120.21	66.4800	47.6100	31.8100	20.5290
SULFATE (mg/L)	65	9.14	.89	2.7163	5.8480	3.3000	2.2100	1.5600	1.1060
NITRATE (mg/L)	65	3.93	.43	1.7625	3.7120	2.0650	1.6600	1.1850	.7400
CHLORIDE (mg/L)	65	.56	.02	.1451	.3240	.1900	.1300	.0900	.0500
AMMONI UM (mg/L)	65	1.36	.01	.2577	.5490	.3600	.2000	.1200	.0600
SODIUM (mg/L)	65	.637	.012	.0859	.2840	.0935	.0550	.0350	.0163
POTASSIUM (mg/L)	65	.101	.002	.0199	.0468	.0240	.0160	.0110	.0043
CALCIUM (mg/L)	65	.96	.01	.1654	.4940	.2050	.1200	.0750	.0400
MAGNESIUM (mg/L)	65	.349	.006	.0430	.1379	.0455	.0290	.0205	.0113
TOTAL PRECIPITATION (cm)	71	22.6	.2	6.1070	14.7400	8.5000	5.3000	3.1000	1.2400

Table 13.--Summary statistics for precipitation-weighted monthly mean pH and ion concentrations from precipitation-chemistry data-collection sites for which 1 or more years of data are available--Continued

Property or Constituent (Unit)	Summary Statistics: Sample Size	Maximum	Minimum	Mean	Percentage of Samples in which Values Were Less than or Equal to Those Shown: 95	75	Median 50	25	5
	Station Number		048a		Station Name	Brookhaven, N.Y.			
LAB PH	90	5.01	3.73	4.3561	4.8060	4.5250	4.3350	4.1675	3.9875
HYDROGEN ION (ug/L)	90	188.26	9.77	51.4456	103.158	67.8700	45.7400	29.5300	15.7025
SULFATE (mg/L)	94	7.4	.29	2.4670	5.2825	3.4125	2.0200	1.4800	.9000
NITRATE (mg/L)	94	6.8	.26	1.6115	3.9725	1.9975	1.3950	.8150	.4375
CHLORIDE (mg/L)	94	13.86	.15	1.3463	3.0850	1.5975	.9300	.6150	.3275
AMMONIUM (mg/L)	94	1.24	.03	.2544	.7925	.2950	.1850	.1100	.0400
SODIUM (mg/L)	94	7.923	.075	.7711	1.7577	.9915	.5690	.2980	.1272
POTASSIUM (mg/L)	94	.466	.009	.0718	.3162	.0722	.0400	.0210	.0127
CALCIUM (mg/L)	94	.42	.02	.1097	.2600	.1400	.0850	.0700	.0300
MAGNESIUM (mg/L)	94	.796	.017	.0953	.1975	.1245	.0750	.0480	.0240
TOTAL PRECIPITATION (cm)	95	30.2	.1	8.8663	20.8000	12.0000	7.8000	4.4000	1.7000
	Station Number		055a		Station Name	Delaware, Ohio			
LAB PH	87	4.78	3.77	4.2756	4.4960	4.4000	4.2900	4.1800	3.9940
HYDROGEN ION (ug/L)	87	170.28	16.5	57.0199	102.51	65.7600	51.5600	39.6000	31.8340
SULFATE (mg/L)	87	7.92	1.12	3.2497	5.3800	3.9100	3.0200	2.4200	1.5880
NITRATE (mg/L)	87	4.55	.29	1.9999	3.2960	2.4600	1.9200	1.5400	.9540
CHLORIDE (mg/L)	87	.53	.03	.1910	.4120	.2500	.1600	.1200	.0640
AMMONIUM (mg/L)	87	2.48	.05	.3730	.7760	.4500	.3400	.1900	.0780
SODIUM (mg/L)	87	.825	.018	.1447	.4310	.1640	.0930	.0560	.0268
POTASSIUM (mg/L)	87	.699	.003	.0413	.1184	.0380	.0250	.0150	.0090
CALCIUM (mg/L)	87	.93	.03	.2579	.5420	.3400	.2300	.1400	.0640
MAGNESIUM (mg/L)	87	.195	.008	.0533	.1256	.0650	.0470	.0290	.0142
TOTAL PRECIPITATION (cm)	87	29.5	.7	7.7126	18.9400	10.1000	6.2000	3.7000	1.2000
	Station Number		056a		Station Name	Caldwell, Ohio			
LAB PH	88	5.9	3.65	4.1947	4.4555	4.2775	4.1900	4.0825	3.9245
HYDROGEN ION (ug/L)	88	221.6	1.26	70.5519	119.127	83.0775	64.2800	53.1100	35.2890
SULFATE (mg/L)	88	13.1	1.22	3.7840	6.4180	4.6875	3.5000	2.7250	1.7315
NITRATE (mg/L)	88	3.97	.56	1.9709	3.2030	2.4900	1.8500	1.5100	.9635
CHLORIDE (mg/L)	88	7.74	.06	.3283	.7160	.2800	.2000	.1500	.1100
AMMONIUM (mg/L)	88	.84	.04	.2745	.5665	.3675	.2500	.1700	.0745
SODIUM (mg/L)	88	5.29	.015	.1885	.5432	.1412	.0830	.0530	.0310
POTASSIUM (mg/L)	88	.55	.006	.0368	.0897	.0370	.0270	.0162	.0084
CALCIUM (mg/L)	88	2.02	.06	.2761	.6130	.3450	.2200	.1425	.0700
MAGNESIUM (mg/L)	88	.266	.011	.0508	.1094	.0627	.0405	.0292	.0154
TOTAL PRECIPITATION (cm)	88	30.9	1.6	8.3261	18.4100	10.9500	6.8500	4.5000	2.1450

Table 13.--Summary statistics for precipitation-weighted monthly mean pH and ion concentrations from precipitation-chemistry data-collection sites for which 1 or more years of data are available--Continued

Property or Constituent (Unit)	Summary Statistics: Sample Size	Maximum	Minimum	Mean	Percentage of Samples in which Values Were Less than or Equal to Those Shown: 95	75	Median 50	25	5
Station Number 057a				Station Name Oxford, Ohio					
LAB PH	85	4.83	3.9	4.2578	4.4700	4.3500	4.2600	4.2000	3.9730
HYDROGEN ION (ug/L)	85	125.89	14.79	58.9622	106.74	63.6850	55.4300	44.7100	33.9920
SULFATE (mg/L)	88	7.08	.77	3.0174	5.4755	3.6800	2.7350	1.9700	1.3960
NITRATE (mg/L)	88	3.63	.71	1.7043	3.0445	2.0250	1.6100	1.2325	.7680
CHLORIDE (mg/L)	88	.58	.07	.2217	.4955	.2700	.2000	.1500	.1000
AMMONIUM (mg/L)	88	1.28	.06	.3587	.7640	.4675	.3300	.2100	.1300
SODIUM (mg/L)	88	.371	.009	.0818	.2112	.1050	.0655	.0440	.0139
POTASSIUM (mg/L)	88	.331	.008	.0499	.2158	.0555	.0285	.0190	.0104
CALCIUM (mg/L)	88	.8	.01	.1799	.4965	.2300	.1450	.0800	.0500
MAGNESIUM (mg/L)	88	.103	.005	.0273	.0625	.0347	.0225	.0142	.0070
TOTAL PRECIPITATION (cm)	88	21.1	.4	7.8568	16.8200	11.5250	6.6500	4.3500	1.9000
Station Number 057b				Station Name Oxford, Ohio					
LAB PH	17	4.61	4.14	4.3429	4.6100	4.4650	4.3100	4.2050	4.1400
HYDROGEN ION (ug/L)	17	72.98	24.55	47.7365	72.9800	62.2000	49.1200	33.9300	24.5500
SULFATE (mg/L)	17	3.72	1.21	2.4059	3.7200	3.0800	2.2900	1.6850	1.2100
NITRATE (mg/L)	17	2.99	.66	1.3576	2.9900	1.5900	1.2200	.9300	.6600
CHLORIDE (mg/L)	17	.35	.05	.1459	.3500	.1700	.1400	.0950	.0500
AMMONIUM (mg/L)	17	.43	.04	.2024	.4300	.2750	.1800	.1100	.0400
SODIUM (mg/L)	17	.166	.019	.0668	.1660	.0820	.0650	.0370	.0190
POTASSIUM (mg/L)	17	.029	.003	.0149	.0290	.0200	.0130	.0110	.0030
CALCIUM (mg/L)	17	.29	.05	.1253	.2900	.1650	.1100	.0800	.0500
MAGNESIUM (mg/L)	17	.093	.02	.0332	.0930	.0400	.0260	.0230	.0200
TOTAL PRECIPITATION (cm)	17	20.7	1.9	8.9882	20.7000	12.3000	9.2000	4.5000	1.9000
Station Number 058a				Station Name Wooster, Ohio					
LAB PH	88	4.88	3.74	4.2568	4.5000	4.3700	4.2700	4.1425	3.9735
HYDROGEN ION (ug/L)	88	181.06	13.29	60.0344	106.416	72.0675	54.0350	42.9075	31.5950
SULFATE (mg/L)	88	10.85	1.62	3.5691	5.7930	4.1750	3.3950	2.4950	1.7615
NITRATE (mg/L)	88	4.61	.34	2.0010	3.3020	2.4950	1.8750	1.4450	.8790
CHLORIDE (mg/L)	88	1.16	.05	.2110	.4710	.2475	.1900	.1300	.0700
AMMONIUM (mg/L)	88	1.46	.06	.4024	.7855	.5600	.3500	.2500	.1090
SODIUM (mg/L)	88	1.082	.017	.1444	.6678	.1407	.0795	.0507	.0240
POTASSIUM (mg/L)	88	.113	.004	.0281	.0638	.0327	.0230	.0170	.0090
CALCIUM (mg/L)	88	1.24	.04	.2484	.6925	.3000	.2050	.1400	.0745
MAGNESIUM (mg/L)	88	.191	.012	.0491	.1107	.0587	.0430	.0302	.0180
TOTAL PRECIPITATION (cm)	88	24.1	1	7.4693	15.3100	9.3750	6.5000	3.7250	2.2450

Table 13.--Summary statistics for precipitation-weighted monthly mean pH and ion concentrations from precipitation-chemistry data-collection sites for which 1 or more years of data are available--Continued

Property or Constituent (Unit)	Summary Statistics: Sample Size	Summary Statistics: Maximum	Summary Statistics: Minimum	Summary Statistics: Mean	Percentage of Samples in which Values Were Less than or Equal to Those Shown: 95	75	Median 50	25	5
	Station Number	063a		Station Name	Kane, Pa.				
LAB PH	75	4.81	3.72	4.1864	4.4840	4.3200	4.2000	4.0600	3.8620
HYDROGEN ION (ug/L)	75	191.44	15.44	71.4413	137.626	86.1400	62.5800	47.9500	32.8180
SULFATE (mg/L)	75	7.24	.71	3.3631	6.7840	4.4900	3.0500	2.1600	1.3500
NITRATE (mg/L)	75	5.92	.82	2.1123	3.5800	2.5200	1.9200	1.6000	.9060
CHLORIDE (mg/L)	75	3.96	.01	.2529	.5620	.2300	.1700	.1200	.0700
AMMONIUM (mg/L)	75	.85	.04	.2947	.5740	.4100	.2600	.1900	.0800
SODIUM (mg/L)	75	.885	.017	.1165	.4938	.1320	.0610	.0430	.0238
POTASSIUM (mg/L)	75	.188	.006	.0294	.0838	.0310	.0230	.0160	.0110
CALCIUM (mg/L)	75	.74	.04	.1687	.4240	.2100	.1400	.0900	.0500
MAGNESIUM (mg/L)	75	.161	.009	.0387	.1208	.0390	.0280	.0210	.0148
TOTAL PRECIPITATION (cm)	89	27.6	3.1	10.5989	19.5500	13.0500	10.2000	7.1000	4.5000
	Station Number	064a		Station Name	Leading Ridge, Pa.				
LAB PH	81	4.74	3.6	4.2160	4.5960	4.3650	4.2100	4.0600	3.8830
HYDROGEN ION (ug/L)	81	252.12	18.2	68.8272	130.045	87.1800	61.9400	43.1400	25.2880
SULFATE (mg/L)	81	14.7	.81	3.3346	6.2490	4.3600	2.9400	1.9700	1.0830
NITRATE (mg/L)	81	5.77	.82	2.1383	3.7950	2.5400	2.0500	1.5200	.9250
CHLORIDE (mg/L)	81	.49	.08	.2237	.4490	.2850	.1900	.1500	.1100
AMMONIUM (mg/L)	81	1.02	.05	.2981	.6350	.3950	.2800	.1600	.0710
SODIUM (mg/L)	81	1.469	.019	.1414	.3598	.1540	.0930	.0595	.0273
POTASSIUM (mg/L)	81	.147	.008	.0410	.0908	.0515	.0350	.0215	.0150
CALCIUM (mg/L)	81	.58	.05	.1791	.3700	.2250	.1400	.1100	.0600
MAGNESIUM (mg/L)	81	.11	.011	.0390	.0883	.0500	.0340	.0250	.0171
TOTAL PRECIPITATION (cm)	81	23.9	2.1	8.8975	17.1600	11.4500	8.4000	5.2000	3.0100
	Station Number	065a		Station Name	Penn State, Pa.				
LAB PH	107	4.6	3.62	4.1756	4.5160	4.3200	4.1700	4.0400	3.8340
HYDROGEN ION (ug/L)	107	237.25	25.04	74.4353	146.644	91.4000	67.1100	47.8900	30.4780
SULFATE (mg/L)	112	10.44	.84	3.1741	6.5000	4.3275	2.6750	1.7700	.9885
NITRATE (mg/L)	112	6.69	.72	2.1461	3.6630	2.5700	2.0050	1.5025	1.0125
CHLORIDE (mg/L)	112	.94	.03	.2519	.5435	.3175	.2000	.1600	.0865
AMMONIUM (mg/L)	112	1.21	.04	.3118	.6705	.4275	.2750	.1500	.0930
SODIUM (mg/L)	107	.385	.007	.0864	.2630	.1170	.0630	.0400	.0130
POTASSIUM (mg/L)	107	.299	.006	.0479	.1420	.0600	.0360	.0190	.0084
CALCIUM (mg/L)	101	.7	.02	.1628	.4460	.2150	.1300	.0750	.0400
MAGNESIUM (mg/L)	100	.086	.004	.0235	.0599	.0300	.0190	.0112	.0080
TOTAL PRECIPITATION (cm)	112	22.7	1	8.3777	17.1350	11.0000	8.2000	4.7500	2.0650

Table 13.--Summary statistics for precipitation-weighted monthly mean pH and ion concentrations from precipitation-chemistry data-collection sites for which 1 or more years of data are available--Continued

Property or Constituent (Unit)	Summary Statistics: Sample Size	Summary Statistics: Maximum	Summary Statistics: Minimum	Summary Statistics: Mean	Percentage of Samples in which Values Were Less than or Equal to Those Shown: 95	75	Median 50	25	5
	Station Number	065b		Station Name	Penn State, Pa.				
LAB PH	31	4.66	3.59	4.1739	4.6240	4.2900	4.1500	4.0300	3.7640
HYDROGEN ION (ug/L)	31	257.26	22.03	76.2974	182.464	92.8600	70.2200	50.7100	23.8060
SULFATE (mg/L)	31	13.93	.95	3.4103	9.3160	4.5400	2.9500	1.7500	1.0040
NITRATE (mg/L)	31	4.76	.78	2.1819	3.9200	2.5900	2.1700	1.6700	.7980
CHLORIDE (mg/L)	31	.38	.09	.1984	.3740	.2300	.1700	.1500	.1080
AMMONIUM (mg/L)	31	.92	.01	.2810	.6980	.3700	.2700	.1200	.0160
SODIUM (mg/L)	31	.198	.026	.0705	.1668	.0970	.0570	.0410	.0266
POTASSIUM (mg/L)	31	.086	.007	.0239	.0686	.0280	.0210	.0130	.0070
CALCIUM (mg/L)	31	.41	.05	.1558	.3620	.2000	.1400	.0900	.0500
MAGNESIUM (mg/L)	31	.082	.014	.0341	.0700	.0450	.0310	.0220	.0146
TOTAL PRECIPITATION (cm)	31	21.8	2.3	8.4968	21.5600	11.5000	7.2000	4.3000	2.5400
	Station Number	075a		Station Name	Parsons, W. Va.				
LAB PH	90	4.7	3.8	4.3019	4.6190	4.4825	4.3050	4.1250	3.9865
HYDROGEN ION (ug/L)	90	157.87	20.06	55.5732	103.604	75.3875	49.5700	33.0775	24.0095
SULFATE (mg/L)	90	7.49	.99	2.9850	5.0255	3.8150	2.9550	1.8825	1.2565
NITRATE (mg/L)	90	3.14	.01	1.6761	2.7890	2.1075	1.6500	1.2100	.7800
CHLORIDE (mg/L)	90	.37	.04	.1463	.2945	.1800	.1300	.1075	.0600
AMMONIUM (mg/L)	90	.59	.01	.2223	.4545	.3100	.1950	.1100	.0600
SODIUM (mg/L)	90	1	.014	.1017	.3441	.0970	.0630	.0407	.0205
POTASSIUM (mg/L)	90	.14	.006	.0347	.0846	.0412	.0280	.0220	.0116
CALCIUM (mg/L)	90	.96	.05	.2290	.5315	.2825	.1900	.1300	.0755
MAGNESIUM (mg/L)	90	.114	.009	.0320	.0644	.0370	.0290	.0190	.0120
TOTAL PRECIPITATION (cm)	90	32.4	1.5	11.4100	20.6950	14.7000	10.4500	7.4750	4.7000
	Station Number	143a		Station Name	Longwoods, Ont.				
LAB PH	38	4.79	3.89	4.2261	4.5905	4.2825	4.2350	4.1225	3.9660
HYDROGEN ION (UG/	38	128.82	16.12	64.3047	107.815	75.8900	58.2200	52.2500	25.6485
SULFATE (mg/L)	38	6.49	1.69	3.4937	5.4545	4.2975	3.3300	2.7275	1.8230
NITRATE (mg/L)	38	12.88	1.26	2.8016	5.2325	3.1875	2.4350	1.9050	1.2790
CHLORIDE (mg/L)	38	.76	.13	.3097	.7125	.3825	.2700	.1800	.1395
AMMONIUM (mg/L)	38	1.36	.13	.5082	1.1225	.6025	.4900	.3200	.2060
SODIUM (mg/L)	33	.665	.018	.1677	.6188	.2300	.0960	.0595	.0243
POTASSIUM (mg/L)	38	.106	.018	.0480	.1050	.0582	.0415	.0260	.0189
CALCIUM (mg/L)	38	1.75	.07	.4824	1.0470	.5800	.4400	.2475	.1080
MAGNESIUM (mg/L)	38	.24	.013	.0769	.1773	.0960	.0740	.0387	.0168
TOTAL PRECIPITATION (cm)	38	15.7	.1	8.3105	14.6550	10.8000	9.0500	5.0750	3.1400

Table 13.--Summary statistics for precipitation-weighted monthly mean pH and ion concentrations from precipitation-chemistry data-collection sites for which 1 or more years of data are available--Continued

Property or Constituent (Unit)	Summary Statistics: Sample Size	Maximum	Minimum	Mean	Percentage of Samples in which Values Were Less than or Equal to Those Shown: 95	75	Median 50	25	5
	Station Number 143b			Station Name Longwoods (b), Ont.					
LAB PH	58	4.7	3.84	4.2564	4.4925	4.3650	4.3000	4.1075	3.9265
HYDROGEN ION (ug/L)	58	145.87	19.84	60.2626	118.46	78.1050	50.3050	42.8750	31.9870
SULFATE (mg/L)	58	6	.94	3.2910	5.6745	4.1825	3.0850	2.3000	1.6680
NITRATE (mg/L)	58	4.21	.96	2.3498	4.0135	2.8525	2.2500	1.7725	1.2695
CHLORIDE (mg/L)	58	.48	.08	.1988	.3630	.2400	.1900	.1400	.0900
AMMONIUM (mg/L)	58	1.06	.06	.4860	.9925	.6125	.4550	.3200	.1860
SODIUM (mg/L)	58	.216	.024	.0779	.1492	.1072	.0700	.0447	.0288
POTASSIUM (mg/L)	58	.149	.006	.0520	.1381	.0572	.0470	.0340	.0127
CALCIUM (mg/L)	58	1	.08	.3140	.6820	.3825	.2850	.2075	.0895
MAGNESIUM (mg/L)	58	.178	.013	.0560	.1319	.0662	.0490	.0340	.0178
TOTAL PRECIPITATION (cm)	66	15.9	1.9	8.0000	14.2600	10.6250	7.8000	5.0750	3.4350
	Station Number 151a			Station Name Scranton, Pa.					
LAB PH	75	4.69	3.82	4.2139	4.6380	4.3600	4.2400	4.0300	3.8820
HYDROGEN ION (ug/L)	75	150.96	20.36	68.5244	131.376	93.0000	56.9300	43.6800	22.8140
SULFATE (mg/L)	75	6.43	.64	2.6156	6.0700	3.4400	2.1200	1.3700	.9360
NITRATE (mg/L)	75	5.24	.48	1.8355	3.7140	2.3800	1.6300	1.2400	.6660
CHLORIDE (mg/L)	75	1.4	.03	.1989	.6060	.2200	.1400	.1000	.0700
AMMONIUM (mg/L)	75	1.17	.04	.2499	.6900	.3100	.2100	.1100	.0580
SODIUM (mg/L)	75	.882	-.011	.1024	.4188	.1090	.0590	.0310	.0126
POTASSIUM (mg/L)	69	.187	-.01	.0304	.0875	.0390	.0200	.0135	.0005
CALCIUM (mg/L)	75	.59	.01	.1111	.2900	.1400	.0900	.0500	.0200
MAGNESIUM (mg/L)	75	.113	.004	.0212	.0570	.0270	.0160	.0100	.0058
TOTAL PRECIPITATION (cm)	75	24.8	.2	7.0693	15.7000	9.3000	6.2000	4.5000	1.6000
	Station Number 153a			Station Name Zanesville, Ohio					
LAB PH	84	4.43	3.8	4.1610	4.3700	4.2700	4.1750	4.0525	3.8925
HYDROGEN ION (ug/L)	84	159.8	36.88	73.0835	128.09	88.0700	66.6650	54.0525	42.6700
SULFATE (mg/L)	84	8.86	1.13	3.0927	5.3375	3.5475	2.8950	1.9925	1.5150
NITRATE (mg/L)	84	5.04	.57	1.8493	3.2050	2.1375	1.7300	1.3750	.9625
CHLORIDE (mg/L)	84	.72	.07	.2120	.5175	.2575	.1800	.1300	.0900
AMMONIUM (mg/L)	84	1.19	.05	.3261	.6825	.4100	.3000	.1900	.1025
SODIUM (mg/L)	84	.804	.012	.1085	.2800	.1125	.0760	.0395	.0192
POTASSIUM (mg/L)	69	.611	.007	.0394	.0765	.0370	.0240	.0150	.0080
CALCIUM (mg/L)	84	.83	.07	.2332	.5675	.2825	.1900	.1400	.0725
MAGNESIUM (mg/L)	84	.143	.008	.0314	.0712	.0377	.0250	.0182	.0112
TOTAL PRECIPITATION (cm)	84	32.2	1	9.0845	20.8500	12.3500	7.6500	4.2000	2.2250

Table 13.--Summary statistics for precipitation-weighted monthly mean pH and ion concentrations from precipitation-chemistry data-collection sites for which 1 or more years of data are available--Continued

Property or Constituent (Unit)	Summary Statistics: Sample Size	Maximum	Minimum	Mean	Percentage of Samples in which Values Were Less than or Equal to Those Shown: 95	75	Median 50	25	5
Station Number 154a				Station Name Rockport, Ind.					
LAB PH	84	4.6	3.77	4.2396	4.5400	4.3475	4.2500	4.1325	3.9500
HYDROGEN ION (ug/L)	84	170.63	25.27	62.0232	113.125	73.3125	55.9250	44.5225	28.9025
SULFATE (mg/L)	84	7.64	1.05	2.8357	5.3475	3.4025	2.5450	2.0025	1.3950
NITRATE (mg/L)	84	3.06	.44	1.3564	2.4775	1.6050	1.2750	1.0200	.6125
CHLORIDE (mg/L)	84	.8	.03	.1786	.3675	.2100	.1450	.1100	.0750
AMMONIUM (mg/L)	84	.88	.09	.3092	.6975	.3675	.2800	.2100	.1300
SODIUM (mg/L)	84	3.137	-.005	.1232	.2865	.1110	.0680	.0445	.0162
POTASSIUM (mg/L)	69	.257	-.015	.0419	.1180	.0525	.0270	.0160	.0065
CALCIUM (mg/L)	84	.85	.04	.1951	.4575	.2700	.1500	.0925	.0425
MAGNESIUM (mg/L)	84	.076	.005	.0258	.0540	.0335	.0210	.0140	.0072
TOTAL PRECIPITATION (cm)	84	31.2	1	9.7179	20.2750	13.1750	8.9000	5.5000	2.1750
Station Number 156a				Station Name Fort Wayne, Ind.					
LAB PH	83	5.61	3.68	4.3201	4.6760	4.4200	4.3300	4.2100	3.8960
HYDROGEN ION (ug/L)	83	11.09	2.44	55.0406	126.692	62.2700	46.9900	38.1700	21.0960
SULFATE (mg/L)	83	9.01	.56	2.9746	5.3300	3.4000	2.7100	2.1800	1.4780
NITRATE (mg/L)	83	8.31	.81	2.0494	3.9940	2.2700	1.8100	1.4000	.9620
CHLORIDE (mg/L)	83	1.15	.05	.1663	.2700	.2100	.1300	.1000	.0720
AMMONIUM (mg/L)	83	1.58	.13	.4548	.8000	.5500	.4400	.3100	.1720
SODIUM (mg/L)	83	.493	.003	.0816	.2112	.1050	.0570	.0370	.0102
POTASSIUM (mg/L)	68	.351	.004	.0401	.0801	.0487	.0290	.0195	.0092
CALCIUM (mg/L)	83	1.63	.06	.3224	.8280	.3700	.2500	.1600	.0800
MAGNESIUM (mg/L)	83	.508	.01	.0777	.2470	.0930	.0510	.0340	.0174
TOTAL PRECIPITATION (cm)	84	17.7	.6	7.7095	14.0250	10.6000	7.4500	4.8250	1.3000
Station Number 158a				Station Name Lewisburg, W. Va.					
LAB PH	24	5.63	3.93	4.4462	5.4625	4.5500	4.4050	4.2275	3.9325
HYDROGEN ION (ug/L)	24	117.06	2.34	45.8792	116.452	59.5650	39.5750	28.2950	4.4875
SULFATE (mg/L)	24	4.24	.28	1.8225	4.1025	2.5650	1.7500	1.0025	.3625
NITRATE (mg/L)	24	1.88	.19	1.0050	1.8700	1.3675	.9650	.6825	.2325
CHLORIDE (mg/L)	24	.6	.04	.1267	.4975	.1400	.1150	.0625	.0425
AMMONIUM (mg/L)	24	1.96	.03	.3529	1.7375	.3625	.2350	.1100	.0350
SODIUM (mg/L)	24	.365	.018	.1179	.3645	.1405	.0735	.0487	.0215
POTASSIUM (mg/L)	18	.333	.009	.0593	.3330	.0570	.0335	.0177	.0090
CALCIUM (mg/L)	24	.87	.05	.1604	.7100	.1875	.1300	.0725	.0500
MAGNESIUM (mg/L)	24	.076	.006	.0199	.0750	.0215	.0170	.0102	.0062
TOTAL PRECIPITATION (cm)	24	16.7	.4	6.4125	16.3500	8.0000	5.8000	3.8000	.7750

Table 13.--Summary statistics for precipitation-weighted monthly mean pH and ion concentrations from precipitation-chemistry data-collection sites for which 1 or more years of data are available--Continued

Property or Constituent (Unit)	Summary Statistics: Sample Size	Maximum	Minimum	Mean	Percentage of Samples in which Values Were Less than or Equal to Those Shown: 95	75	Median 50	25	5
Station Number 168a				Station Name Huntington, N.Y.					
LAB PH	82	5.01	3.7	4.3751	4.6870	4.5100	4.3700	4.2575	4.0115
HYDROGEN ION (ug/L)	82	201.24	9.73	47.4567	97.3720	55.5950	42.5700	31.2175	20.6645
SULFATE (mg/L)	82	8.51	.44	2.2950	4.6475	2.9450	1.9950	1.2500	.7030
NITRATE (mg/L)	82	10.13	.39	1.7239	3.2020	2.0025	1.5300	1.1650	.6730
CHLORIDE (mg/L)	82	.69	.02	.1315	.2585	.1600	.1100	.0800	.0500
AMMONIUM (mg/L)	82	1.47	.02	.2400	.5100	.3200	.1950	.1100	.0400
SODIUM (mg/L)	82	.559	.012	.0997	.3127	.1197	.0600	.0375	.0200
POTASSIUM (mg/L)	82	.07	.005	.0211	.0557	.0272	.0165	.0117	.0070
CALCIUM (mg/L)	82	.68	.02	.1343	.3325	.1725	.1100	.0700	.0315
MAGNESIUM (mg/L)	82	.117	.008	.0311	.0798	.0372	.0260	.0177	.0101
TOTAL PRECIPITATION (cm)	86	22	1.9	8.3884	15.0600	10.5250	7.9500	5.8250	2.8750
Station Number 176a				Station Name Colchester, Ont.					
LAB PH	56	4.76	3.79	4.2096	4.6335	4.3175	4.2200	4.0650	3.8455
HYDROGEN ION (ug/L)	56	162.18	17.38	69.7650	142.766	86.1200	60.2600	48.1400	23.3165
SULFATE (mg/L)	59	11.8	1.55	4.7878	10.4000	5.6000	4.6500	3.1500	2.0500
NITRATE (mg/L)	57	7.53	.84	2.9802	5.5340	3.4100	2.7800	2.1500	1.4110
CHLORIDE (mg/L)	57	1.34	.04	.3279	.9100	.3650	.2600	.1850	.1090
AMMONIUM (mg/L)	58	2.67	.16	.7403	2.0410	.8600	.6400	.3775	.1890
SODIUM (mg/L)	53	.855	.02	.1258	.6025	.1325	.0850	.0450	.0250
POTASSIUM (mg/L)	53	.24	.005	.0678	.2000	.0900	.0500	.0300	.0071
CALCIUM (mg/L)	54	2.43	.14	.5785	1.4575	.6825	.4800	.2800	.1575
MAGNESIUM (mg/L)	54	.665	.025	.1487	.4000	.1830	.1150	.0750	.0337
TOTAL PRECIPITATION (cm)	64	29	1.6	7.1469	13.8750	10.2250	6.7500	3.6250	1.8250
Station Number 177a				Station Name Merlin, Ont.					
LAB PH	55	5.16	3.69	4.2695	4.7660	4.4200	4.2200	4.1100	3.8520
HYDROGEN ION (ug/L)	55	204.17	6.92	64.0140	141.858	77.6200	60.2600	38.0200	17.3560
SULFATE (mg/L)	59	14.71	2.4	4.6393	7.9000	5.4500	4.1500	3.3400	2.5500
NITRATE (mg/L)	60	7.13	1.28	3.2527	6.3575	4.2050	2.7700	2.2325	1.5140
CHLORIDE (mg/L)	58	5.05	.04	.3997	1.0495	.4225	.2550	.1875	.0780
AMMONIUM (mg/L)	59	2.64	.08	.6754	1.8900	.8400	.6000	.3400	.2100
SODIUM (mg/L)	55	3.35	.01	.1938	.5210	.1850	.1000	.0400	.0194
POTASSIUM (mg/L)	57	.185	.003	.0588	.1460	.0950	.0500	.0300	.0075
CALCIUM (mg/L)	52	1.86	.1	.7013	1.6840	.8575	.6250	.3975	.1695
MAGNESIUM (mg/L)	52	.8	.02	.1478	.3735	.1962	.1250	.0650	.0265
TOTAL PRECIPITATION (cm)	64	16.5	1.1	7.2187	14.8750	9.2250	6.8000	4.9250	1.3500

Table 13.--Summary statistics for precipitation-weighted monthly mean pH and ion concentrations from precipitation-chemistry data-collection sites for which 1 or more years of data are available--Continued

Property or Constituent (Unit)	Summary Statistics: Sample Size	Summary Statistics: Maximum	Summary Statistics: Minimum	Summary Statistics: Mean	Percentage of Samples in which Values Were Less than or Equal to Those Shown: 95	75	Median 50	25	5
Station Number 178a				Station Name Port Stanley, Ont.					
LAB PH	48	4.92	3.63	4.1885	4.8375	4.2900	4.1450	4.0325	3.8250
HYDROGEN ION (ug/L)	48	234.42	12.02	74.8621	150.601	92.7975	71.6150	51.3275	14.5605
SULFATE (mg/L)	56	12	1.1	4.7480	9.0950	5.8875	4.3250	3.4250	2.1300
NITRATE (mg/L)	55	8.59	.84	3.2798	6.9340	4.0300	2.7900	2.3500	1.6100
CHLORIDE (mg/L)	56	1.11	.05	.2696	.7105	.3500	.1800	.1400	.0870
AMMONIUM (mg/L)	52	1.92	.11	.6488	1.3385	.8025	.6500	.3625	.1590
SODIUM (mg/L)	51	.645	.01	.0981	.2830	.1200	.0800	.0300	.0150
POTASSIUM (mg/L)	50	.275	.005	.0596	.1727	.0720	.0485	.0300	.0080
CALCIUM (mg/L)	45	2.12	.09	.5464	1.7040	.6800	.3800	.2600	.1150
MAGNESIUM (mg/L)	49	.7	.005	.1254	.4050	.1725	.0650	.0450	.0150
TOTAL PRECIPITATION (cm)	64	24.2	1.5	7.7984	17.6500	9.8750	6.6500	4.3500	1.8750
Station Number 179a				Station Name Wilkesport, Ont.					
	53	5.23	3.73	4.2521	4.8940	4.3850	4.1900	4.0800	3.7920
HYDROGEN ION (ug/L)	53	186.21	5.89	67.3719	161.765	83.1950	64.5700	41.2150	13.2820
SULFATE (mg/L)	60	16.4	2.2	5.3703	9.2275	7.1875	4.7000	3.5375	2.3075
NITRATE (mg/L)	58	8.95	1.2	3.4605	7.9025	4.4750	2.9900	2.2600	1.6245
CHLORIDE (mg/L)	56	2.9	.01	.3893	.8110	.4500	.2900	.1925	.1070
AMMONIUM (mg/L)	54	1.84	.13	.8354	1.7100	1.0825	.8150	.4550	.1675
SODIUM (mg/L)	52	.715	.007	.1223	.3312	.1737	.0875	.0525	.0200
POTASSIUM (mg/L)	53	.39	.003	.0767	.1995	.1025	.0600	.0275	.0071
CALCIUM (mg/L)	48	1.5	.17	.6933	1.4610	.9575	.6450	.3675	.2035
MAGNESIUM (mg/L)	52	.36	.025	.1062	.2305	.1400	.0950	.0550	.0282
TOTAL PRECIPITATION (cm)	64	19.4	.9	6.6422	15.5500	9.0000	6.1000	3.7250	1.5500
Station Number 180a				Station Name Alvinston, Ont.					
LAB PH	56	6.2	3.82	4.3668	5.2250	4.4750	4.2950	4.1225	3.9085
HYDROGEN ION (ug/L)	56	151.36	.63	55.3130	123.459	75.4275	50.7050	33.5000	6.3540
SULFATE (mg/L)	57	17.7	1.55	4.2349	7.3100	5.0000	3.7500	2.8000	1.6950
NITRATE (mg/L)	57	7.53	1.24	2.8651	5.8040	3.3450	2.5200	2.0600	1.3610
CHLORIDE (mg/L)	57	.93	.02	.2723	.7610	.3350	.2200	.1450	.0760
AMMONIUM (mg/L)	57	2.46	.09	.6686	2.0240	.7750	.5300	.3300	.1380
SODIUM (mg/L)	55	.42	.02	.1019	.3020	.1300	.0800	.0400	.0200
POTASSIUM (mg/L)	55	.4	.003	.0963	.3130	.1150	.0550	.0350	.0046
CALCIUM (mg/L)	50	1.84	.11	.5656	1.5390	.6975	.4550	.2775	.1620
MAGNESIUM (mg/L)	53	.47	.02	.1136	.3500	.1425	.0800	.0500	.0285
TOTAL PRECIPITATION (cm)	64	20.5	1.4	7.8547	15.9750	10.7250	7.6000	4.0500	2.2750

Table 13.--Summary statistics for precipitation-weighted monthly mean pH and ion concentrations from precipitation-chemistry data-collection sites for which 1 or more years of data are available--Continued

Property or Constituent (Unit)	Summary Statistics: Sample Size	Maximum	Minimum	Mean	Percentage of Samples in which Values Were Less than or Equal to Those Shown: 95	75	Median 50	25	5
	Station Number	181a		Station Name	Shallow Lake, Ont.				
LAB PH	54	4.72	3.74	4.2689	4.5725	4.3650	4.2850	4.1575	3.8775
HYDROGEN ION (ug/L)	54	181.97	19.05	59.4644	132.75	69.5825	51.7300	43.0775	26.7925
SULFATE (mg/L)	55	7.25	1.2	3.4247	6.0880	3.9500	3.3000	2.4000	1.6400
NITRATE (mg/L)	56	6.47	1.24	2.6950	4.5755	3.2450	2.5650	1.9125	1.3565
CHLORIDE (mg/L)	54	.4	.02	.1580	.3325	.1925	.1400	.1075	.0275
AMMONIUM (mg/L)	55	1.41	.17	.6438	1.2460	.8500	.5900	.4200	.2100
SODIUM (mg/L)	54	.25	.005	.0642	.1962	.0900	.0500	.0250	.0065
POTASSIUM (mg/L)	52	.115	.003	.0376	.1017	.0500	.0350	.0200	.0030
CALCIUM (mg/L)	54	1.61	.08	.3367	.7575	.4625	.2650	.1775	.0975
MAGNESIUM (mg/L)	54	.4	.015	.0710	.1632	.0912	.0550	.0350	.0150
TOTAL PRECIPITATION (cm)	63	17.8	1.9	8.4254	15.2200	11.1000	7.9000	5.8000	2.5200
	Station Number	182a		Station Name	Palmerston, Ont.				
LAB PH	49	5.77	4.07	4.4506	5.0150	4.6050	4.4000	4.2500	4.0850
HYDROGEN ION (ug/L)	49	84.35	1.7	41.9000	82.2300	56.2300	39.8100	24.8350	9.7350
SULFATE (mg/L)	57	7.2	1.75	3.8000	6.8650	4.5250	3.5000	2.9000	1.9400
NITRATE (mg/L)	59	6.42	1.24	2.6868	5.0900	3.3200	2.3000	1.9500	1.5100
CHLORIDE (mg/L)	58	.97	0	.2184	.5125	.2825	.1800	.1075	.0695
AMMONIUM (mg/L)	58	1.86	.23	.8614	1.6260	1.0400	.8050	.5675	.3580
SODIUM (mg/L)	57	.325	.005	.0958	.2640	.1400	.0700	.0310	.0100
POTASSIUM (mg/L)	55	.18	.003	.0497	.1500	.0600	.0400	.0300	.0074
CALCIUM (mg/L)	51	1.55	.11	.4941	1.1060	.6900	.4100	.2500	.1260
MAGNESIUM (mg/L)	54	.49	.01	.1287	.3562	.1762	.0950	.0637	.0250
TOTAL PRECIPITATION (cm)	64	22.5	1.7	7.5609	15.3750	9.8750	7.0500	4.3500	2.3000
	Station Number	183a		Station Name	Huron Park, Ont.				
LAB PH	38	5.14	3.83	4.4097	4.9120	4.6275	4.3200	4.2050	3.9250
HYDROGEN ION (ug/L)	38	147.91	7.24	47.6197	119.011	62.0650	47.8750	23.6350	12.3225
SULFATE (mg/L)	44	11.7	1.55	4.5018	9.5625	5.1750	4.2200	3.2125	1.8000
NITRATE (mg/L)	43	8.64	1.2	3.1498	5.7580	4.0400	2.6100	2.1300	1.6480
CHLORIDE (mg/L)	43	.85	.03	.2358	.4660	.3200	.2000	.1300	.0480
AMMONIUM (mg/L)	42	2.51	.14	.8576	1.8900	1.1225	.7400	.4550	.2350
SODIUM (mg/L)	42	.245	.01	.0860	.2327	.1225	.0600	.0350	.0200
POTASSIUM (mg/L)	40	.155	.003	.0410	.1280	.0500	.0350	.0200	.0032
CALCIUM (mg/L)	38	2.17	.2	.7966	2.0845	1.0900	.6600	.4175	.2380
MAGNESIUM (mg/L)	40	.365	.025	.1390	.3197	.2100	.1135	.0675	.0350
TOTAL PRECIPITATION (cm)	49	17.6	1.3	7.4633	16.2000	10.8000	6.6000	3.5000	2.0000

Table 13.--Summary statistics for precipitation-weighted monthly mean pH and ion concentrations from precipitation-chemistry data-collection sites for which 1 or more years of data are available--Continued

Property or Constituent (Unit)	Summary Statistics: Sample Size	Maximum	Minimum	Mean	Percentage of Samples in which Values Were Less than or Equal to Those Shown: 95	75	Median 50	25	5
Station Number 184a				Station Name Waterloo, Ont.					
LAB PH	48	5.3	3.94	4.3512	4.9485	4.4975	4.2800	4.1675	3.9890
HYDROGEN ION (ug/L)	48	114.82	5.01	52.3619	102.59	68.0275	52.4800	31.8050	11.2935
SULFATE (mg/L)	52	10.4	.95	3.8360	8.6575	4.2775	3.6500	2.8625	1.9650
NITRATE (mg/L)	52	5.67	.11	2.6406	5.5530	3.0600	2.3000	1.9600	1.2020
CHLORIDE (mg/L)	52	.79	.02	.2369	.5205	.3275	.1950	.1425	.0765
AMMONIUM (mg/L)	47	2.46	.1	.7147	1.7040	.8100	.6700	.4400	.2200
SODIUM (mg/L)	52	.46	.007	.0963	.2475	.1337	.0800	.0400	.0154
POTASSIUM (mg/L)	51	.24	.003	.0517	.2160	.0600	.0300	.0150	.0050
CALCIUM (mg/L)	50	2.52	.02	.4378	1.0235	.5100	.3600	.2400	.1420
MAGNESIUM (mg/L)	51	.605	.005	.1018	.3060	.1150	.0800	.0500	.0210
TOTAL PRECIPITATION (cm)	64	20.7	2.2	7.9016	16.8500	9.5000	7.1500	5.0000	2.7750
Station Number 186a				Station Name Milton, Ont.					
LAB PH	16	4.88	3.88	4.3869	4.8800	4.5375	4.4350	4.1950	3.8800
HYDROGEN ION (ug/L)	16	131.83	13.25	47.8212	131.83	64.1325	37.0250	29.0075	13.2500
SULFATE (mg/L)	32	7.8	1.1	4.8516	7.5725	6.2375	4.7750	3.1125	1.3925
NITRATE (mg/L)	31	5.67	1.46	3.0610	5.0040	3.7200	2.9700	2.3300	1.5680
CHLORIDE (mg/L)	28	.8	.16	.3711	.7910	.4700	.2900	.2300	.1600
AMMONIUM (mg/L)	32	1.81	.21	.8581	1.6475	1.2175	.8250	.4800	.2490
SODIUM (mg/L)	28	.53	.01	.1513	.4850	.2300	.1000	.0467	.0145
POTASSIUM (mg/L)	30	.275	.003	.0822	.2612	.1400	.0500	.0350	.0030
CALCIUM (mg/L)	19	1.6	.29	.7511	1.6000	.9700	.6900	.5200	.2900
MAGNESIUM (mg/L)	13	.49	.05	.2315	.4900	.3125	.2500	.1300	.0500
TOTAL PRECIPITATION (cm)	43	18.7	1.7	6.8651	14.7600	8.6000	6.3000	4.7000	1.8400
Station Number 187a				Station Name Uxbridge, Ont.					
LAB PH	44	5.46	3.9	4.3905	5.2000	4.4675	4.3150	4.1725	4.0025
HYDROGEN ION (ug/L)	44	125.89	3.47	49.9143	99.5475	67.2250	48.4450	33.9900	6.3925
SULFATE (mg/L)	50	8.35	1.7	3.9108	7.4425	4.7600	3.4000	2.6750	1.7775
NITRATE (mg/L)	51	4.92	1.15	2.7200	4.7560	3.3900	2.5700	2.0800	1.3300
CHLORIDE (mg/L)	50	1.14	.04	.2294	.7025	.2725	.1650	.1175	.0655
AMMONIUM (mg/L)	50	1.45	.1	.6208	1.3005	.7975	.5400	.3950	.2255
SODIUM (mg/L)	47	.655	.005	.0951	.4560	.1050	.0550	.0300	.0070
POTASSIUM (mg/L)	46	.14	.003	.0430	.1347	.0550	.0350	.0200	.0050
CALCIUM (mg/L)	38	1.71	.11	.5366	1.6625	.6900	.4300	.2275	.1575
MAGNESIUM (mg/L)	46	.315	.003	.0864	.2730	.1162	.0550	.0387	.0185
TOTAL PRECIPITATION (cm)	63	17	.2	7.2794	12.4600	10.0000	7.1000	4.5000	2.2600

Table 13.--Summary statistics for precipitation-weighted monthly mean pH and ion concentrations from precipitation-chemistry data-collection sites for which 1 or more years of data are available--Continued

Property or Constituent (Unit)	Summary Statistics: Sample Size	Maximum	Minimum	Mean	Percentage of Samples in which Values Were Less than or Equal to Those Shown: 95	75	Median 50	25	5
Station Number 189a				Station Name Campbellford, Ont.					
LAB PH	53	5.05	3.86	4.3083	4.8150	4.4700	4.2700	4.1150	3.9710
HYDROGEN ION (ug/L)	53	138.04	8.91	56.4042	106.957	76.4900	53.7000	33.8900	15.3340
SULFATE (mg/L)	57	9.85	1	3.8686	9.0850	4.7250	3.7500	2.2500	1.3600
NITRATE (mg/L)	58	5.98	.97	2.9702	5.3885	3.6300	2.6350	2.2900	1.1930
CHLORIDE (mg/L)	56	.5	.03	.2120	.4660	.2700	.1900	.1400	.0785
AMMONIUM (mg/L)	55	1.81	.12	.6447	1.3240	.9800	.5700	.3400	.1660
SODIUM (mg/L)	56	.31	.002	.0874	.1937	.1200	.0750	.0500	.0177
POTASSIUM (mg/L)	51	.28	.003	.0647	.2350	.0800	.0500	.0300	.0060
CALCIUM (mg/L)	50	1.23	.07	.5374	1.1870	.7575	.4800	.2475	.1000
MAGNESIUM (mg/L)	56	.335	.003	.0686	.1895	.0937	.0600	.0262	.0067
TOTAL PRECIPITATION (cm)	64	19	.4	7.0953	16.2500	9.0750	6.9500	3.7500	2.2750
Station Number 190a				Station Name Coldwater, Ont.					
LAB PH	44	5.14	3.91	4.3991	5.0250	4.5300	4.3700	4.2550	4.0300
HYDROGEN ION (ug/L)	44	123.03	7.24	46.1189	93.3300	55.5975	42.7250	29.5350	9.9175
SULFATE (mg/L)	46	6.45	.7	2.8302	5.8125	3.7750	2.6950	1.6875	.8675
NITRATE (mg/L)	47	4.52	.97	2.1836	3.6440	2.6600	1.9900	1.5900	1.0920
CHLORIDE (mg/L)	48	.6	.04	.1881	.4460	.2150	.1600	.1200	.0590
AMMONIUM (mg/L)	46	2.13	.09	.5550	1.7185	.7325	.4200	.2400	.1135
SODIUM (mg/L)	47	.255	.015	.0774	.2310	.1150	.0650	.0300	.0194
POTASSIUM (mg/L)	44	.275	.003	.0574	.2350	.0587	.0360	.0162	.0030
CALCIUM (mg/L)	48	1.8	.07	.3408	.9225	.4675	.2450	.1600	.0745
MAGNESIUM (mg/L)	47	.355	.003	.0583	.2330	.0600	.0400	.0200	.0050
TOTAL PRECIPITATION (cm)	52	24.3	1.9	7.9423	14.5400	9.9500	6.7500	5.6250	3.7650
Station Number 192a				Station Name Smiths Falls, Ont.					
LAB PH	49	5.09	3.98	4.3882	4.9450	4.6450	4.3100	4.1800	4.0250
HYDROGEN ION (ug/L)	49	104.71	8.13	48.8212	94.4150	66.0900	48.9800	22.6500	11.3700
SULFATE (mg/L)	59	6.55	.65	3.1473	6.0000	4.3000	3.0500	1.9500	1.0000
NITRATE (mg/L)	60	6.16	.71	2.4905	4.6010	3.1575	2.3700	1.6925	1.0670
CHLORIDE (mg/L)	56	.76	.02	.1902	.5530	.2200	.1600	.1125	.0385
AMMONIUM (mg/L)	59	1.14	.05	.4497	1.0700	.5900	.4300	.2600	.1200
SODIUM (mg/L)	55	.58	.01	.0991	.3800	.1100	.0600	.0450	.0180
POTASSIUM (mg/L)	52	.175	.003	.0436	.1052	.0600	.0400	.0200	.0043
CALCIUM (mg/L)	49	1.53	.07	.4596	1.0100	.7000	.3700	.2000	.0950
MAGNESIUM (mg/L)	35	.305	.005	.0918	.2690	.1150	.0730	.0380	.0090
TOTAL PRECIPITATION (cm)	64	19	.4	6.7109	12.9250	8.8750	6.0500	3.8000	1.4000

Table 13.--Summary statistics for precipitation-weighted monthly mean pH and ion concentrations from precipitation-chemistry data-collection sites for which 1 or more years of data are available--Continued

Property or Constituent (Unit)	Summary Statistics: Sample Size	Summary Statistics: Maximum	Summary Statistics: Minimum	Summary Statistics: Mean	Percentage of Samples in which Values Were Less than or Equal to Those Shown: 95	75	Median 50	25	5
Station Number 221a				Station Name Melbourne, Ont.					
LAB PH	55	4.76	3.84	4.2242	4.5040	4.3200	4.2400	4.1100	3.8940
HYDROGEN ION (ug/L)	55	145.25	17.38	64.5204	128.558	77.3000	57.7400	47.4400	31.6380
SULFATE (mg/L)	54	6.33	1.32	3.3357	5.7900	4.0550	3.0700	2.3675	1.6850
NITRATE (mg/L)	54	4.53	1.31	2.5089	4.2225	3.2450	2.1650	1.8825	1.4675
CHLORIDE (mg/L)	54	.78	.07	.2069	.4275	.2425	.1750	.1300	.0975
AMMONIUM (mg/L)	54	1.02	.14	.4835	.8900	.6525	.4250	.3100	.2200
SODIUM (mg/L)	54	.334	.01	.0857	.2215	.1117	.0700	.0435	.0157
POTASSIUM (mg/L)	54	.214	.008	.0485	.1085	.0590	.0440	.0280	.0097
CALCIUM (mg/L)	54	1.28	.05	.3304	.9725	.3850	.2600	.1775	.0750
MAGNESIUM (mg/L)	54	.21	.011	.0562	.1552	.0685	.0470	.0295	.0137
TOTAL PRECIPITATION (cm)	62	16.1	1.6	7.4403	14.6100	10.4250	6.7500	4.6750	2.0000
Station Number 222a				Station Name North Easthope, Ont.					
LAB PH	55	4.76	3.91	4.3216	4.6600	4.4700	4.3400	4.1900	3.9340
HYDROGEN ION (ug/L)	55	124.07	17.25	53.0727	116.768	64.5700	45.8100	33.7100	21.8300
SULFATE (mg/L)	55	8.38	1.27	3.2271	6.7880	3.7700	2.8200	2.1500	1.4780
NITRATE (mg/L)	55	5	1.06	2.3100	3.8740	2.8400	2.2600	1.6200	1.1880
CHLORIDE (mg/L)	55	.49	.05	.1907	.3660	.2200	.1800	.1300	.0880
AMMONIUM (mg/L)	55	1.58	.18	.5585	1.3640	.7400	.4600	.3400	.2240
SODIUM (mg/L)	54	.308	.016	.0724	.1467	.0960	.0585	.0355	.0245
POTASSIUM (mg/L)	54	.311	.013	.0557	.1432	.0610	.0465	.0320	.0165
CALCIUM (mg/L)	54	.93	.09	.3165	.7825	.3725	.2650	.1750	.1000
MAGNESIUM (mg/L)	54	.199	.013	.0641	.1707	.0755	.0530	.0380	.0230
TOTAL PRECIPITATION (cm)	62	16	1.9	8.4935	14.9850	11.3250	8.2500	5.4250	3.2300
Station Number 223a				Station Name Wellesley, Ont.					
LAB PH	51	4.65	4	4.3131	4.5480	4.4400	4.3200	4.1900	4.0120
HYDROGEN ION (ug/L)	51	100.74	22.56	52.2253	97.1680	65.2600	47.8300	36.0200	28.2620
SULFATE (mg/L)	51	5.88	1.28	2.9053	5.2280	3.4200	2.6500	2.0400	1.4580
NITRATE (mg/L)	51	3.73	1.11	2.0657	3.3200	2.3700	1.9700	1.6200	1.1440
CHLORIDE (mg/L)	51	1	.04	.1561	.3580	.1700	.1100	.0900	.0660
AMMONIUM (mg/L)	51	1.07	.13	.4718	1.0180	.5400	.4400	.3500	.2180
SODIUM (mg/L)	51	.152	.008	.0482	.1196	.0640	.0390	.0260	.0110
POTASSIUM (mg/L)	51	.055	.005	.0229	.0460	.0300	.0210	.0160	.0050
CALCIUM (mg/L)	51	.77	.05	.2327	.6500	.2800	.1900	.1600	.0760
MAGNESIUM (mg/L)	51	.218	.011	.0478	.1348	.0560	.0360	.0270	.0138
TOTAL PRECIPITATION (cm)	60	16.6	.4	8.5483	14.8850	11.2250	7.7500	5.8000	3.6050

Table 13.--Summary statistics for precipitation-weighted monthly mean pH and ion concentrations from precipitation-chemistry data-collection sites for which 1 or more years of data are available--Continued

Property or Constituent (Unit)	Summary Statistics: Sample Size	Maximum	Minimum	Mean	Percentage of Samples in which Values Were Less than or Equal to Those Shown: 95	75	Median 50	25	5
	Station Number		225a		Station Name	Balsam Lake, Ont.			
LAB PH	53	4.8	3.9	4.3096	4.6820	4.4300	4.3200	4.1750	3.9300
HYDROGEN ION (ug/L)	53	127.25	15.76	54.3711	116.645	67.1100	47.9000	37.2450	20.9420
SULFATE (mg/L)	53	5.49	.62	2.6230	4.7540	3.5100	2.4000	1.6850	.9180
NITRATE (mg/L)	53	4.13	.73	2.0683	3.4670	2.5050	1.9500	1.5900	1.0970
CHLORIDE (mg/L)	53	.45	.04	.1581	.3530	.1850	.1400	.0900	.0670
AMMONIUM (mg/L)	53	1.39	.04	.3753	1.0420	.4500	.3300	.2050	.0910
SODIUM (mg/L)	53	.23	.011	.0623	.2186	.0705	.0480	.0305	.0144
POTASSIUM (mg/L)	53	.303	.007	.0422	.1750	.0395	.0290	.0165	.0080
CALCIUM (mg/L)	53	1.16	.04	.2636	.8800	.2950	.2100	.1300	.0600
MAGNESIUM (mg/L)	53	.234	.004	.0388	.1020	.0510	.0270	.0155	.0084
TOTAL PRECIPITATION (cm)	62	26.1	.9	7.4403	13.1000	9.6500	6.7000	4.6500	2.1500
	Station Number		226a		Station Name	Raven Lake, Ont.			
LAB PH	50	4.69	3.89	4.2874	4.6545	4.3850	4.3000	4.1525	3.9900
HYDROGEN ION (ug/L)	50	127.46	20.41	56.1576	103.358	69.9725	50.1750	41.0375	22.2595
SULFATE (mg/L)	50	5.4	.92	2.7838	4.8965	3.5800	2.5650	1.7800	1.0005
NITRATE (mg/L)	50	4.03	.93	2.1968	3.6750	2.5100	2.0900	1.7550	1.0795
CHLORIDE (mg/L)	50	.31	.04	.1592	.2790	.1900	.1550	.1275	.0655
AMMONIUM (mg/L)	50	.91	.06	.4002	.7915	.5050	.4100	.2600	.1510
SODIUM (mg/L)	50	.165	.007	.0598	.1330	.0800	.0550	.0317	.0205
POTASSIUM (mg/L)	50	.086	.009	.0341	.0683	.0425	.0320	.0210	.0095
CALCIUM (mg/L)	50	.97	.06	.2426	.6790	.2725	.1950	.1400	.0700
MAGNESIUM (mg/L)	50	.216	.007	.0380	.1070	.0467	.0290	.0160	.0096
TOTAL PRECIPITATION (cm)	59	21.7	2.2	7.8729	13.9000	9.8000	7.3000	5.5000	3.3000
	Station Number		227a		Station Name	Charleston Lake, Ont.			
LAB PH	51	4.83	3.95	4.2933	4.7540	4.4200	4.2700	4.1200	3.9660
HYDROGEN ION (ug/L)	51	111.5	14.68	56.8196	107.502	75.9900	53.4100	38.3700	17.7160
SULFATE (mg/L)	51	4.84	.67	2.5475	4.3300	3.5100	2.4600	1.6500	1.0580
NITRATE (mg/L)	51	4.68	.55	1.9924	3.9300	2.4100	1.9400	1.3900	.7620
CHLORIDE (mg/L)	51	.31	.03	.1282	.2880	.1600	.1100	.0800	.0600
AMMONIUM (mg/L)	51	.93	.08	.3527	.7180	.4600	.3300	.2400	.1160
SODIUM (mg/L)	51	.193	.003	.0517	.1728	.0700	.0370	.0220	.0086
POTASSIUM (mg/L)	51	.073	.004	.0254	.0624	.0340	.0210	.0130	.0046
CALCIUM (mg/L)	51	.74	.02	.1561	.3960	.1700	.1300	.1000	.0580
MAGNESIUM (mg/L)	51	.132	.007	.0287	.0908	.0300	.0240	.0150	.0076
TOTAL PRECIPITATION (cm)	60	16.1	.1	7.7700	14.3000	10.2250	7.6000	5.0500	2.2050

Table 13.--Summary statistics for precipitation-weighted monthly mean pH and ion concentrations from precipitation-chemistry data-collection sites for which 1 or more years of data are available--Continued

Property or Constituent (Unit)	Summary Statistics				Percentage of Samples in which Values Were Less than or Equal to Those Shown				
	Sample Size	Maximum	Minimum	Mean	95	75	Median 50	25	5
	Station Number		228a		Station Name	Railton, Ont.			
LAB PH	55	4.79	3.89	4.2527	4.6220	4.3600	4.2100	4.1300	3.9560
HYDROGEN ION (ug/L)	55	128.77	16.32	61.1069	110.266	74.3400	61.0500	43.6600	23.9560
SULFATE (mg/L)	55	7.02	.96	3.0155	5.5020	3.6400	2.8700	2.1200	1.3020
NITRATE (mg/L)	56	4.78	.44	2.2612	4.5840	2.5725	2.0800	1.6450	.9280
CHLORIDE (mg/L)	56	.52	.02	.1655	.3600	.2075	.1450	.1100	.0385
AMMONIUM (mg/L)	55	1.13	.1	.4445	.7860	.5700	.4300	.2900	.1620
SODIUM (mg/L)	55	.25	.003	.0745	.1936	.0940	.0650	.0380	.0144
POTASSIUM (mg/L)	54	.142	.004	.0361	.1032	.0382	.0320	.0237	.0072
CALCIUM (mg/L)	55	1.75	.02	.2731	.6280	.3200	.2300	.1500	.0660
MAGNESIUM (mg/L)	55	.13	.005	.0353	.0806	.0450	.0300	.0210	.0088
TOTAL PRECIPITATION (cm)	66	19.3	1.2	7.6258	13.6500	9.6250	7.7500	4.9250	1.9400
	Station Number		229a		Station Name	Graham Lake, Ont.			
LAB PH	55	5.07	4	4.3253	4.8460	4.4500	4.3200	4.1300	4.0100
HYDROGEN ION (ug/L)	55	100.05	8.55	53.2440	97.0980	73.7400	48.3800	35.7700	14.3560
SULFATE (mg/L)	55	7.47	.41	2.7905	5.5480	3.8300	2.2400	2.0100	.9600
NITRATE (mg/L)	55	5.98	.34	2.2813	4.9820	2.8100	2.0400	1.6300	.7560
CHLORIDE (mg/L)	55	3.33	.05	.2451	.5580	.2400	.1700	.1100	.0600
AMMONIUM (mg/L)	55	1	.09	.4482	.9160	.5700	.4200	.2700	.1740
SODIUM (mg/L)	55	3.171	.005	.1502	.3736	.1200	.0680	.0420	.0158
POTASSIUM (mg/L)	54	.247	.003	.0507	.1430	.0690	.0415	.0215	.0065
CALCIUM (mg/L)	55	2.7	.01	.3024	.9080	.3300	.2000	.1300	.0480
MAGNESIUM (mg/L)	55	.575	.005	.0552	.1292	.0570	.0350	.0260	.0108
TOTAL PRECIPITATION (cm)	63	17.9	1.5	7.7238	14.6600	9.8000	6.9000	5.4000	2.8600
	Station Number		230a		Station Name	Whitman Creek, Ont.			
LAB PH	37	4.79	3.93	4.2232	4.6190	4.3400	4.1600	4.0750	3.9750
HYDROGEN ION (ug/L)	37	116.56	16.3	64.8354	105.895	83.6450	69.0800	45.5500	24.0130
SULFATE (mg/L)	37	8.2	.2	3.3700	6.8590	3.9750	3.4300	2.5050	1.1090
NITRATE (mg/L)	36	6.42	.22	2.2428	4.6520	2.8850	1.9400	1.4775	1.0020
CHLORIDE (mg/L)	35	1.09	.05	.1954	.6580	.2000	.1400	.1100	.0580
AMMONIUM (mg/L)	37	.96	.06	.4738	.9510	.6000	.4300	.3100	.1500
SODIUM (mg/L)	36	.67	.013	.0900	.5051	.0815	.0510	.0350	.0172
POTASSIUM (mg/L)	36	.149	.014	.0414	.1099	.0527	.0345	.0252	.0174
CALCIUM (mg/L)	36	.63	.04	.2336	.6300	.3250	.1950	.1400	.0570
MAGNESIUM (mg/L)	36	.125	.01	.0386	.0842	.0490	.0360	.0232	.0125
TOTAL PRECIPITATION (cm)	49	20.8	.2	5.8429	12.7500	8.2000	5.1000	2.9500	.7500

Table 13.--Summary statistics for precipitation-weighted monthly mean pH and ion concentrations from precipitation-chemistry data-collection sites for which 1 or more years of data are available--Continued

Property or Constituent (Unit)	Summary Statistics: Sample Size	Maximum	Minimum	Mean	Percentage of Samples in which Values Were Less than or Equal to Those Shown: 95	75	Median 50	25	5
Station Number 239a				Station Name Clearfield, KY					
LAB PH	50	4.61	3.83	4.2732	4.5315	4.3825	4.2900	4.1800	3.9700
HYDROGEN ION (ug/L)	50	148.42	24.45	57.4376	106.542	65.6850	51.6000	41.2725	29.5855
SULFATE (mg/L)	50	8.78	.85	2.6128	5.1960	3.3200	2.3050	1.6275	1.2920
NITRATE (mg/L)	50	3.27	.67	1.5292	2.5040	1.8350	1.4000	1.1725	.8165
CHLORIDE (mg/L)	50	.3	.07	.1450	.2335	.1700	.1350	.1100	.0755
AMMONIUM (mg/L)	50	1.08	.11	.3018	.7530	.3500	.2600	.1800	.1155
SODIUM (mg/L)	50	.196	.011	.0609	.1296	.0710	.0565	.0360	.0162
POTASSIUM (mg/L)	50	.121	0	.0313	.1049	.0375	.0240	.0157	.0062
CALCIUM (mg/L)	50	.61	.03	.1716	.3780	.2225	.1350	.1050	.0400
MAGNESIUM (mg/L)	50	.08	.005	.0218	.0461	.0280	.0190	.0120	.0070
TOTAL PRECIPITATION (cm)	50	21.7	1.6	9.2560	20.5900	12.5750	8.4500	4.9750	2.4200
Station Number 241a				Station Name Gaylord, Mich.					
LAB PH	50	4.9	3.97	4.4264	4.7445	4.5525	4.4250	4.2800	4.1120
HYDROGEN ION (ug/L)	50	106.91	12.62	40.6390	76.8095	52.0000	37.6550	27.7450	18.0990
SULFATE (mg/L)	50	6.35	.49	1.9130	3.7275	2.3700	1.8850	1.2725	.6110
NITRATE (mg/L)	50	6.39	.33	1.6622	3.7570	1.9375	1.4350	1.0700	.7285
CHLORIDE (mg/L)	50	.26	.02	.0798	.1700	.1000	.0600	.0500	.0300
AMMONIUM (mg/L)	50	.94	.05	.3466	.9135	.4150	.3100	.2100	.0910
SODIUM (mg/L)	50	.104	-.003	.0278	.0909	.0382	.0205	.0117	.0030
POTASSIUM (mg/L)	50	.067	.001	.0191	.0489	.0260	.0145	.0107	.0045
CALCIUM (mg/L)	50	.57	.01	.1516	.4520	.1900	.1200	.0800	.0355
MAGNESIUM (mg/L)	50	.134	.003	.0270	.0992	.0312	.0220	.0120	.0051
TOTAL PRECIPITATION (cm)	50	21.8	.8	6.1440	14.2150	7.3750	5.6000	3.5250	1.4750
Station Number 243a				Station Name Big Moose, N.Y.					
LAB PH	51	4.95	3.91	4.3102	4.7020	4.4200	4.3000	4.1700	4.0140
HYDROGEN ION (ug/L)	51	122.59	11.21	53.7306	96.1160	68.2800	49.7600	37.9500	19.8940
SULFATE (mg/L)	51	5.84	.21	2.2804	5.1460	2.6800	1.8500	1.2900	.5920
NITRATE (mg/L)	51	3.6	.31	1.7894	3.4080	2.0600	1.7000	1.2100	.7580
CHLORIDE (mg/L)	51	.25	.01	.1222	.2240	.1500	.1100	.0900	.0620
AMMONIUM (mg/L)	51	.9	.01	.3025	.7340	.4000	.2500	.2000	.0660
SODIUM (mg/L)	51	.119	-.013	.0504	.1114	.0670	.0480	.0290	.0086
POTASSIUM (mg/L)	51	.272	.002	.0525	.2194	.0560	.0310	.0200	.0052
CALCIUM (mg/L)	51	.6	0	.1302	.3780	.1500	.1100	.0800	.0400
MAGNESIUM (mg/L)	51	.119	.003	.0257	.0800	.0280	.0200	.0130	.0070
TOTAL PRECIPITATION (cm)	51	28.7	4.1	10.8235	22.0600	13.3000	10.2000	6.8000	4.8800

Table 13.--Summary statistics for precipitation-weighted monthly mean pH and ion concentrations from precipitation-chemistry data-collection sites for which 1 or more years of data are available--Continued

Property or Constituent (Unit)	Summary Statistics: Sample Size	Maximum	Minimum	Mean	Percentage of Samples in which Values Were Less than or Equal to Those Shown: 95	75	Median 50	25	5
Station Number 244a				Station Name McArthur, Ohio					
LAB PH	32	4.45	3.76	4.1803	4.4305	4.2900	4.1950	4.0850	3.8185
HYDROGEN ION (ug/L)	32	175.49	35.31	71.2387	154.085	82.3650	63.5200	51.3700	36.9025
SULFATE (mg/L)	32	8.6	1.14	2.7716	6.8970	3.2250	2.3550	1.7350	1.1790
NITRATE (mg/L)	32	3.37	.81	1.6728	3.0710	1.9125	1.6950	1.1825	.8490
CHLORIDE (mg/L)	32	.51	.08	.1722	.3410	.2050	.1600	.1125	.0865
AMMONIUM (mg/L)	32	.7	.09	.2631	.5440	.3300	.2850	.1525	.0965
SODIUM (mg/L)	32	.235	.011	.0534	.1771	.0652	.0460	.0262	.0116
POTASSIUM (mg/L)	32	.07	-.011	.0211	.0544	.0335	.0160	.0092	-.0032
CALCIUM (mg/L)	32	.51	.04	.1650	.4125	.2175	.1350	.0725	.0400
MAGNESIUM (mg/L)	32	.069	.005	.0224	.0560	.0287	.0185	.0120	.0056
TOTAL PRECIPITATION (cm)	32	18.8	1.3	7.6781	17.3700	10.1750	6.9500	3.7500	2.1450
Station Number 272a				Station Name Purdue U Ag Farm, Ind.					
LAB PH	42	4.86	3.74	4.3164	4.6860	4.4600	4.3300	4.1775	3.9140
HYDROGEN ION (ug/L)	42	180.41	13.8	54.0802	123.973	66.8250	46.7550	34.6250	20.6470
SULFATE (mg/L)	42	6.31	.88	2.9748	4.8790	3.7725	2.7650	2.0925	1.4045
NITRATE (mg/L)	42	4.8	.3	1.8490	4.0310	2.3075	1.7750	1.2400	.8975
CHLORIDE (mg/L)	42	5.1	.06	.3726	1.3615	.2775	.1700	.1300	.0730
AMMONIUM (mg/L)	42	1.04	.01	.4150	.8670	.5025	.3800	.2575	.0325
SODIUM (mg/L)	42	.301	.019	.0996	.2820	.1287	.0840	.0527	.0291
POTASSIUM (mg/L)	42	.138	.007	.0356	.1128	.0372	.0270	.0170	.0076
CALCIUM (mg/L)	42	.78	.05	.2833	.7220	.3900	.2900	.1175	.0515
MAGNESIUM (mg/L)	42	.206	.014	.0577	.1712	.0687	.0485	.0292	.0181
TOTAL PRECIPITATION (cm)	42	22.2	.5	7.3738	20.2350	10.0500	5.9000	4.0500	1.1750
Station Number 343a				Station Name Huntington, Ind.					
LAB PH	24	6.13	3.88	4.4521	5.7550	4.5950	4.4050	4.2825	3.9150
HYDROGEN ION (ug/L)	24	132.34	.75	44.8146	123.13	52.2075	39.5400	25.6575	6.3775
SULFATE (mg/L)	23	7.63	1.36	2.9439	7.3360	3.2900	2.6100	2.0200	1.3620
NITRATE (mg/L)	23	10.78	.98	2.2443	9.6540	2.1500	1.5900	1.2600	.9940
CHLORIDE (mg/L)	23	3.33	.09	.3261	2.7640	.2300	.1600	.1400	.0920
AMMONIUM (mg/L)	23	1.26	.12	.4387	1.2360	.6000	.3700	.2200	.1240
SODIUM (mg/L)	23	3.306	.031	.2439	2.7006	.1370	.0740	.0600	.0312
POTASSIUM (mg/L)	23	.293	.016	.0550	.2812	.0510	.0270	.0220	.0160
CALCIUM (mg/L)	23	2.53	.06	.3591	2.1680	.3300	.2900	.1100	.0640
TOTAL PRECIPITATION (CM	29	18	.3	7.7655	17.1500	11.1000	8.0000	4.4500	1.0000

Table 13.--Summary statistics for precipitation-weighted monthly mean pH and ion concentrations from precipitation-chemistry data-collection sites for which 1 or more years of data are available--Continued

Property or Constituent (Unit)	Summary Statistics: Sample Size	Maximum	Minimum	Mean	Percentage of Samples in which Values Were Less than or Equal to Those Shown: 95	75	Median 50	25	5
Station Number 346a				Station Name Perryville, Ky.					
LAB PH	25	4.7	4.12	4.3724	4.6580	4.4850	4.3800	4.2750	4.1230
HYDROGEN ION (ug/L)	25	76.33	19.75	44.6944	75.4180	53.2900	42.1500	32.8700	22.1410
SULFATE (mg/L)	25	5.04	1.43	2.4404	4.7010	2.8800	2.0700	1.8500	1.4480
NITRATE (mg/L)	25	2.77	.64	1.4056	2.7520	1.7050	1.2600	1.0000	.6550
CHLORIDE (mg/L)	25	1.11	.08	.2156	.8820	.2300	.1600	.1400	.0920
AMMONIUM (mg/L)	25	.6	.04	.2560	.5730	.3700	.2200	.1400	.0520
SODIUM (mg/L)	25	.761	.024	.1208	.6068	.1250	.0870	.0550	.0279
POTASSIUM (mg/L)	25	.097	.006	.0281	.0895	.0330	.0230	.0140	.0081
CALCIUM (mg/L)	25	.61	.06	.1916	.5350	.2500	.1800	.1050	.0600
MAGNESIUM (mg/L)	25	.238	.016	.0437	.2032	.0380	.0330	.0235	.0172
TOTAL PRECIPITATION (cm)	25	17.5	.4	7.9040	17.2900	11.2500	7.5000	3.7500	1.0300
Station Number 347a				Station Name Lilley Cornett Wood, Ky.					
LAB PH	28	5.38	3.93	4.4525	5.1595	4.6275	4.4450	4.2750	3.9390
HYDROGEN ION (ug/L)	28	118.14	4.17	43.5189	115.314	53.4500	35.8450	23.4250	8.0985
SULFATE (mg/L)	28	4.41	.8	2.1611	4.3560	2.6900	1.8600	1.3650	.8180
NITRATE (mg/L)	28	2.51	.55	1.3171	2.3795	1.7450	1.1800	1.0025	.5860
CHLORIDE (mg/L)	28	1.5	.07	.3029	1.3245	.2950	.1950	.1025	.0745
AMMONIUM (mg/L)	28	.41	.03	.1739	.4055	.2600	.1350	.0725	.0300
SODIUM (mg/L)	28	.161	.027	.0717	.1574	.0945	.0630	.0400	.0283
POTASSIUM (mg/L)	28	.125	.009	.0301	.0989	.0335	.0225	.0132	.0090
CALCIUM (mg/L)	28	.8	.05	.2736	.6965	.3500	.2900	.1325	.0590
MAGNESIUM (mg/L)	28	.074	.013	.0375	.0735	.0537	.0320	.0220	.0152
TOTAL PRECIPITATION (cm)	28	23.5	1.6	8.9679	20.7550	11.0000	8.1500	5.7250	1.9150
Station Number 348a				Station Name Clark State Fish Hatchery, Ky.					
LAB PH	28	5.4	4.09	4.4014	5.0715	4.5075	4.3900	4.2275	4.1080
HYDROGEN ION (ug/L)	28	80.88	3.98	44.2818	77.5275	59.1775	40.4750	31.1875	11.7965
SULFATE (mg/L)	28	4.73	1	2.2943	4.3205	2.9850	1.9750	1.6525	1.1080
NITRATE (mg/L)	28	2.55	.65	1.4171	2.5185	1.7100	1.2650	.9825	.7310
CHLORIDE (mg/L)	28	.35	.06	.1489	.2915	.1850	.1350	.1125	.0780
AMMONIUM (mg/L)	28	.76	.03	.2007	.6160	.2775	.1650	.1000	.0300
SODIUM (mg/L)	28	.198	.026	.0783	.1665	.0902	.0735	.0630	.0332
POTASSIUM (mg/L)	28	.094	.009	.0269	.0737	.0367	.0240	.0130	.0090
CALCIUM (mg/L)	28	.59	.04	.1796	.4955	.2500	.1800	.0825	.0445
MAGNESIUM (mg/L)	28	.099	.015	.0334	.0792	.0405	.0290	.0217	.0150
TOTAL PRECIPITATION (cm)	28	17.7	2.4	8.2607	16.5300	12.5250	7.1500	3.8000	2.5800

Table 13.--Summary statistics for precipitation-weighted monthly mean pH and ion concentrations from precipitation-chemistry data-collection sites for which 1 or more years of data are available--Continued

Property or Constituent (Unit)	Summary Statistics: Sample Size	Maximum	Minimum	Mean	Percentage of Samples in which Values Were Less than or Equal to Those Shown: 95	75	Median 50	25	5
	Station Number	358a		Station Name	West Point, N.Y.				
LAB PH	28	4.64	3.99	4.3039	4.6130	4.4725	4.3100	4.1350	3.9945
HYDROGEN ION (ug/L)	28	102.36	22.66	54.5304	101.226	73.1075	48.9250	33.9700	24.3655
SULFATE (mg/L)	28	3.92	1.04	2.3043	3.8525	2.9125	2.2800	1.6050	1.0760
NITRATE (mg/L)	28	4.27	.64	1.8579	4.2205	2.4375	1.6450	1.1100	.6895
CHLORIDE (mg/L)	28	1.64	.13	.4468	1.4105	.5875	.3500	.1900	.1300
AMMONIUM (mg/L)	28	.72	.02	.2075	.6030	.2975	.1750	.0875	.0245
SODIUM (mg/L)	28	.894	.038	.2187	.7711	.2590	.1695	.0925	.0384
POTASSIUM (mg/L)	28	.07	.005	.0249	.0619	.0300	.0205	.0162	.0068
CALCIUM (mg/L)	28	.28	.04	.1136	.2530	.1575	.0900	.0725	.0400
MAGNESIUM (mg/L)	28	.228	.021	.0579	.1798	.0770	.0420	.0310	.0223
TOTAL PRECIPITATION (cm)	28	23.5	1.7	11.0464	22.7800	16.6500	11.1500	4.5750	1.9250
	Station Number	359a		Station Name	Biscuit Brook, N.Y.				
LAB PH	22	4.8	3.73	4.3559	4.7985	4.6200	4.3550	4.1575	3.7630
HYDROGEN ION (ug/L)	22	186.21	15.75	54.2518	174.918	69.0775	43.9450	24.1875	15.7935
SULFATE (mg/L)	22	9.04	.73	2.4032	8.4115	2.9200	1.9550	1.1025	.7435
NITRATE (mg/L)	22	7.52	.18	1.8427	6.9965	2.1775	1.5250	.8275	.2460
CHLORIDE (mg/L)	22	.6	.06	.1927	.5805	.2700	.1400	.1100	.0615
AMMONIUM (mg/L)	22	1.41	.01	.2223	1.2555	.2825	.1850	.0500	.0100
SODIUM (mg/L)	22	.339	.008	.0935	.3231	.1520	.0695	.0257	.0096
POTASSIUM (mg/L)	22	.157	.002	.0268	.1432	.0290	.0175	.0107	.0029
CALCIUM (mg/L)	22	.37	.02	.1091	.3535	.1425	.0850	.0475	.0215
MAGNESIUM (mg/L)	22	.12	.011	.0345	.1144	.0385	.0235	.0195	.0111
TOTAL PRECIPITATION (cm)	27	21.8	2.6	10.8815	20.8000	13.6000	10.7000	6.4000	3.3600
	Station Number	371a		Station Name	Milford, Pa.				
LAB PH	25	4.63	3.91	4.2960	4.6150	4.4700	4.3200	4.1200	3.9280
HYDROGEN ION (ug/L)	25	123.06	23.44	56.2196	117.984	75.7750	47.6100	34.0800	24.3850
SULFATE (mg/L)	25	5.68	.82	2.4372	5.4970	3.1650	2.0200	1.5000	.8740
NITRATE (mg/L)	25	4.12	.01	1.8668	3.9100	2.5250	1.6300	1.2950	.1900
CHLORIDE (mg/L)	25	1.12	.07	.2772	1.0180	.3450	.1900	.1350	.0760
AMMONIUM (mg/L)	25	.9	.01	.2172	.7620	.3400	.1800	.0700	.0100
SODIUM (mg/L)	25	.605	.021	.1341	.5495	.1500	.0990	.0550	.0222
POTASSIUM (mg/L)	25	.177	.009	.0435	.1536	.0605	.0310	.0200	.0093
CALCIUM (mg/L)	25	.33	.03	.1124	.3120	.1400	.1000	.0600	.0300
MAGNESIUM (mg/L)	25	.128	.01	.0401	.1148	.0530	.0310	.0220	.0115
TOTAL PRECIPITATION (cm)	25	18.8	1.6	9.2600	18.4700	15.0500	7.6000	4.7000	1.7200

Table 13.--Summary statistics for precipitation-weighted monthly mean pH and ion concentrations from precipitation-chemistry data-collection sites for which 1 or more years of data are available--Continued

Property or Constituent (Unit)	Summary Statistics: Sample Size	Maximum	Minimum	Mean	Percentage of Samples in which Values Were Less than or Equal to Those Shown: 95	75	Median 50	25	5
	Station Number		379a		Station Name	Babcock State Park, W. Va.			
LAB PH	28	4.7	4.07	4.3779	4.6910	4.5375	4.4050	4.1650	4.0790
HYDROGEN ION (ug/L)	28	84.49	19.79	46.4596	82.9420	67.8025	39.5250	28.9250	20.3795
SULFATE (mg/L)	28	4.72	1.07	2.2346	4.4905	2.5750	1.8700	1.4225	1.1060
NITRATE (mg/L)	28	2.89	.53	1.3661	2.7505	1.6775	1.2700	.9825	.5660
CHLORIDE (mg/L)	28	.29	.03	.1486	.2855	.1850	.1400	.1125	.0480
AMMONIUM (mg/L)	28	.47	.01	.1929	.4295	.2975	.1750	.1125	.0100
SODIUM (mg/L)	28	.14	.017	.0629	.1224	.0817	.0610	.0427	.0174
POTASSIUM (mg/L)	28	.146	.007	.0366	.1055	.0427	.0340	.0227	.0106
CALCIUM (mg/L)	28	.3	.02	.1343	.2910	.1750	.1100	.0800	.0335
MAGNESIUM (mg/L)	28	.067	.009	.0289	.0575	.0380	.0275	.0190	.0103
TOTAL PRECIPITATION (cm)	28	23.3	2.9	10.0357	21.8600	12.5000	9.4500	6.1250	3.3050
	Station Number		420a		Station Name	Southwest Purdue, Ind.			
LAB PH	14	4.82	3.9	4.3471	4.8200	4.5000	4.3400	4.2025	3.9000
HYDROGEN ION (ug/L)	14	125.89	15.09	51.4629	125.89	62.8100	45.7100	31.9400	15.0900
SULFATE (mg/L)	14	4.62	1.1	2.4936	4.6200	3.1550	2.4600	1.7200	1.1000
NITRATE (mg/L)	14	3.2	.41	1.2179	3.2000	1.7550	.8550	.6150	.4100
CHLORIDE (mg/L)	14	3.6	.09	.4779	3.6000	.3825	.1900	.1800	.0900
AMMONIUM (mg/L)	14	.64	.01	.1964	.6400	.2325	.1500	.1075	.0100
SODIUM (mg/L)	14	.197	.03	.0887	.1970	.1175	.0725	.0492	.0300
POTASSIUM (mg/L)	14	.081	.009	.0291	.0810	.0340	.0215	.0167	.0090
CALCIUM (mg/L)	14	1.27	.04	.2143	1.2700	.2025	.1150	.0750	.0400
MAGNESIUM (mg/L)	14	.215	.006	.0429	.2150	.0390	.0275	.0210	.0060
TOTAL PRECIPITATION (cm)	16	28	1.2	11.0062	28.0000	17.3000	10.7500	4.7500	1.2000
	Station Number		423a		Station Name	Land Between the Lakes, Ky.			
LAB PH	15	4.85	3.92	4.4947	4.8500	4.7000	4.5200	4.3300	3.9200
HYDROGEN ION (ug/L)	15	121.51	14.13	37.8020	121.51	46.5900	30.2300	19.8100	14.1300
SULFATE (mg/L)	15	6.15	.76	1.9367	6.1500	2.2700	1.3000	1.0000	.7600
NITRATE (mg/L)	15	3.72	.25	1.0827	3.7200	1.3400	1.0700	.4900	.2500
CHLORIDE (mg/L)	15	.73	.03	.1767	.7300	.2300	.1200	.0800	.0300
AMMONIUM (mg/L)	15	.53	.01	.1567	.5300	.1700	.1100	.0400	.0100
SODIUM (mg/L)	15	.158	.028	.0699	.1580	.0930	.0540	.0420	.0280
POTASSIUM (mg/L)	15	.74	.005	.0648	.7400	.0250	.0140	.0110	.0050
CALCIUM (mg/L)	15	.33	.03	.1213	.3300	.1600	.0800	.0400	.0300
MAGNESIUM (mg/L)	15	.051	.008	.0237	.0510	.0300	.0200	.0150	.0080
TOTAL PRECIPITATION (cm)	15	24.4	2.2	13.5000	24.4000	18.6000	13.0000	9.6000	2.2000

Table 14.--Summary statistics for monthly ion-deposition data from precipitation-chemistry data-collection sites for which 3 or more years of data are available

[mg/m^2, milligrams per square meter; g/m^2, grams per square meter; cm, centimeter]

Property or Constituent (Unit)	Summary Statistics: Sample Size	Summary Statistics: Maximum	Summary Statistics: Minimum	Summary Statistics: Mean	Percentage of Samples in Which Values Were Less than or Equal To Those Shown: 95	75	Median 50	25	5
Station Number 025a				Station Name Indiana Dunes, Ind.					
HYDROGEN ION (mg/m^2)	66	18.58	0.01	3.6717	9.8025	4.3200	2.9550	1.5950	0.3515
SULFATE (g/m^2)	66	1.11	.02	.2714	.8790	.3225	.2200	.1375	.0600
NITRATE (g/m^2)	66	.9	.04	.1553	.4395	.1900	.1100	.0900	.0435
CHLORIDE (g/m^2)	66	.124	.003	.0169	.0453	.0202	.0125	.0080	.0050
AMMONIUM (g/m^2)	66	.204	.004	.0353	.1119	.0375	.0260	.0167	.0080
SODIUM (g/m^2)	66	.0466	.0016	.0076	.0196	.0091	.0061	.0030	.0017
POTASSIUM (g/m^2)	66	.0106	.0006	.0026	.0074	.0032	.0021	.0013	.0007
CALCIUM (g/m^2)	66	.298	.008	.0364	.1054	.0385	.0265	.0157	.0090
MAGNESIUM (g/m^2)	66	.0694	.002	.0076	.0191	.0078	.0051	.0034	.0023
TOTAL PRECIPITATION (cm)	66	25	1.6	8.1076	19.0850	10.2000	7.7000	3.9000	1.8000
Station Number 032a				Station Name Kellogg, Mich.					
HYDROGEN ION (mg/m^2)	78	10.15	.02	3.6171	9.0340	5.2250	3.2050	1.7175	.6385
SULFATE (g/m^2)	78	.69	.01	.2329	.4805	.3400	.2150	.1200	.0300
NITRATE (g/m^2)	78	.43	.02	.1528	.3405	.2100	.1350	.0900	.0400
CHLORIDE (g/m^2)	78	.049	.001	.0121	.0323	.0155	.0095	.0060	.0030
AMMONIUM (g/m^2)	78	.089	0	.0317	.0733	.0452	.0270	.0157	.0059
SODIUM (g/m^2)	78	.1099	.0005	.0124	.0655	.0089	.0048	.0032	.0013
POTASSIUM (g/m^2)	78	.0056	.0003	.0020	.0044	.0029	.0017	.0010	.0004
CALCIUM (g/m^2)	78	.064	.002	.0200	.0451	.0270	.0170	.0097	.0039
MAGNESIUM (g/m^2)	78	.0096	.0007	.0040	.0088	.0056	.0034	.0021	.0009
TOTAL PRECIPITATION (cm)	79	20.4	.6	7.6253	14.9000	10.5000	6.9000	4.2000	1.7000
Station Number 033a				Station Name Wellston, Mich.					
HYDROGEN ION (mg/m^2)	78	9.48	.21	3.3177	8.3730	4.1875	2.8050	1.7225	.9160
SULFATE (g/m^2)	78	.56	.03	.2087	.4500	.2725	.1900	.1175	.0400
NITRATE (g/m^2)	78	.37	.03	.1633	.3015	.2100	.1600	.1175	.0495
CHLORIDE (g/m^2)	78	.117	.002	.0147	.0322	.0172	.0110	.0080	.0039
AMMONIUM (g/m^2)	78	.111	0	.0322	.0900	.0390	.0275	.0167	.0059
SODIUM (g/m^2)	78	.1937	.0013	.0161	.1209	.0093	.0050	.0032	.0017
POTASSIUM (g/m^2)	78	.0115	.0003	.0024	.0048	.0032	.0020	.0013	.0005
CALCIUM (g/m^2)	78	.081	.004	.0219	.0521	.0310	.0175	.0110	.0050
MAGNESIUM (g/m^2)	78	.0241	.001	.0052	.0127	.0061	.0041	.0026	.0012
TOTAL PRECIPITATION (cm)	86	19.6	.3	8.0640	16.6050	10.3500	7.8500	5.8000	2.4000

Table 14.--Summary statistics for monthly ion-deposition data from precipitation-chemistry data-collection sites for which 3 or more years of data are available--Continued

Property or Constituent (Unit)	Summary Statistics: Sample Size	Maximum	Minimum	Mean	Percentage of Samples in Which Values Were Less than or Equal To Those Shown: 95	75	Median 50	25	5
Station Number 040a Station Name Aurora, N.Y.									
HYDROGEN ION (mg/m^2)	81	15.26	0.63	4.7364	11.9710	6.2850	3.9300	2.3050	0.9280
SULFATE (g/m^2)	81	.73	.02	.2488	.6090	.3750	.2000	.1250	.0510
NITRATE (g/m^2)	81	.48	.02	.1527	.2700	.2050	.1400	.1000	.0510
CHLORIDE (g/m^2)	81	.033	.004	.0129	.0240	.0150	.0120	.0090	.0050
AMMONIUM (g/m^2)	81	.081	.004	.0269	.0615	.0380	.0220	.0130	.0041
SODIUM (g/m^2)	81	.0817	.0009	.0077	.0258	.0085	.0046	.0028	.0016
POTASSIUM (g/m^2)	81	.0164	.0002	.0021	.0063	.0023	.0014	.0008	.0004
CALCIUM (g/m^2)	81	.069	.002	.0140	.0335	.0190	.0110	.0070	.0030
MAGNESIUM (g/m^2)	81	.0134	.0004	.0030	.0062	.0039	.0025	.0016	.0007
TOTAL PRECIPITATION (cm)	81	17.5	1.1	7.1160	14.8500	9.7500	6.4000	4.2500	2.4000
Station Number 041a Station Name Chautauqua, N.Y.									
HYDROGEN ION (mg/m^2)	67	18.51	.46	5.9103	12.9660	7.8100	5.3000	3.1700	1.1200
SULFATE (g/m^2)	67	.96	.05	.3024	.6660	.4100	.2800	.1800	.0540
NITRATE (g/m^2)	67	.8	.04	.1887	.3900	.2100	.1700	.1300	.0640
CHLORIDE (g/m^2)	67	.051	.004	.0178	.0332	.0210	.0160	.0130	.0084
AMMONIUM (g/m^2)	67	.121	.001	.0338	.0768	.0440	.0300	.0190	.0050
SODIUM (g/m^2)	67	.0843	.002	.0086	.0207	.0098	.0061	.0039	.0023
POTASSIUM (g/m^2)	67	.0981	.0007	.0046	.0090	.0040	.0025	.0017	.0009
CALCIUM (g/m^2)	67	.06	.005	.0172	.0322	.0210	.0140	.0110	.0054
MAGNESIUM (g/m^2)	67	.0122	.0009	.0039	.0086	.0047	.0033	.0027	.0015
TOTAL PRECIPITATION (cm)	67	24.9	1.5	8.9836	18.2400	11.3000	8.5000	5.9000	2.2800
Station Number 042a Station Name Knobit, N.Y.									
HYDROGEN ION (mg/m^2)	59	8.89	.35	3.6090	8.7800	4.7900	3.0600	1.6500	.8400
SULFATE (g/m^2)	59	.4	.02	.1724	.3800	.2500	.1700	.0800	.0300
NITRATE (g/m^2)	59	.36	.02	.1293	.3000	.1800	.1100	.0700	.0400
CHLORIDE (g/m^2)	59	.048	.002	.0137	.0340	.0170	.0110	.0080	.0050
AMMONIUM (g/m^2)	59	.046	.001	.0165	.0440	.0240	.0140	.0050	.0020
SODIUM (g/m^2)	59	.0461	.0006	.0082	.0306	.0087	.0055	.0037	.0019
POTASSIUM (g/m^2)	59	.0052	.0003	.0017	.0040	.0021	.0014	.0010	.0003
CALCIUM (g/m^2)	59	.045	.002	.0109	.0380	.0120	.0080	.0060	.0020
MAGNESIUM (g/m^2)	59	.0195	.0009	.0031	.0067	.0039	.0024	.0016	.0009
TOTAL PRECIPITATION (cm)	67	25.3	1.2	7.8851	15.8800	10.6000	7.6000	4.2000	2.0000

Table 14.--Summary statistics for monthly ion-deposition data from precipitation-chemistry data-collection sites for which 3 or more years of data are available--Continued

Property or Constituent (Unit)	Summary Statistics				Percentage of Samples in Which Values Were Less than or Equal To Those Shown				
	Sample Size	Maxi-mum	Mini-mum	Mean	95	75	Median 50	25	5
Station Number 043a Station Name Whiteface, N.Y.									
HYDROGEN ION (mg/m^2)	108	13.16	0.2	3.8346	8.7020	4.9775	3.3550	2.2725	0.8825
SULFATE (g/m^2)	111	.61	.01	.1700	.4360	.2300	.1500	.0800	.0300
NITRATE (g/m^2)	111	.27	.01	.1077	.2100	.1300	.1000	.0700	.0360
CHLORIDE (g/m^2)	111	.099	0	.0126	.0424	.0130	.0090	.0060	.0020
AMMONIUM (g/m^2)	111	.076	0	.0188	.0518	.0260	.0150	.0080	.0030
SODIUM (g/m^2)	106	.021	0	.0033	.0079	.0038	.0025	.0018	.0005
POTASSIUM (g/m^2)	105	.0368	.0003	.0037	.0156	.0037	.0020	.0010	.0004
CALCIUM (g/m^2)	101	.027	.001	.0071	.0180	.0095	.0060	.0030	.0010
MAGNESIUM (g/m^2)	100	.0063	.0002	.0013	.0043	.0016	.0009	.0005	.0002
TOTAL PRECIPITATION (cm)	111	21.2	1.2	8.1901	17.1200	10.1000	7.7000	5.1000	2.3200
Station Number 044a Station Name Ithaca, N.Y.									
HYDROGEN ION (mg/m^2)	104	22.31	1.42	5.7986	12.4450	7.4975	4.8850	3.2525	1.9000
SULFATE (g/m^2)	110	1.07	.03	.2416	.5880	.3200	.1950	.1100	.0500
NITRATE (g/m^2)	110	.35	.04	.1583	.2900	.1900	.1500	.1200	.0700
CHLORIDE (g/m^2)	110	.119	0	.0171	.0374	.0192	.0140	.0100	.0045
AMMONIUM (g/m^2)	110	.113	.002	.0238	.0539	.0322	.0190	.0110	.0045
SODIUM (g/m^2)	106	.0252	.0001	.0042	.0129	.0053	.0031	.0018	.0009
POTASSIUM (g/m^2)	106	.025	.0001	.0025	.0072	.0026	.0018	.0011	.0005
CALCIUM (g/m^2)	101	.024	.002	.0095	.0220	.0120	.0080	.0060	.0020
MAGNESIUM (g/m^2)	100	.0039	.0002	.0015	.0033	.0020	.0014	.0009	.0004
TOTAL PRECIPITATION (cm)	111	20.2	.2	8.4532	17.2200	10.6000	7.9000	5.5000	2.6200
Station Number 045a Station Name Stilwell Lake, N.Y.									
HYDROGEN ION (mg/m^2)	63	14.08	.97	5.6276	11.3840	8.1800	5.1800	3.4700	1.3580
SULFATE (g/m^2)	63	.67	.05	.2627	.4780	.3600	.2500	.1400	.0500
NITRATE (g/m^2)	63	.32	.03	.1603	.2980	.2100	.1500	.1000	.0600
CHLORIDE (g/m^2)	63	.561	.004	.0538	.2404	.0550	.0270	.0150	.0080
AMMONIUM (g/m^2)	63	.047	.002	.0178	.0436	.0290	.0150	.0080	.0030
SODIUM (g/m^2)	63	.2993	.002	.0328	.1534	.0348	.0145	.0072	.0028
POTASSIUM (g/m^2)	63	.0116	.0004	.0025	.0066	.0030	.0020	.0013	.0005
CALCIUM (g/m^2)	63	.04	.002	.0121	.0258	.0160	.0110	.0070	.0032
MAGNESIUM (g/m^2)	63	.0398	.0008	.0057	.0182	.0062	.0039	.0027	.0011
TOTAL PRECIPITATION (cm)	64	33.4	1.4	11.3078	24.1500	15.6750	10.4000	5.8500	2.1250

Table 14.--Summary statistics for monthly ion-deposition data from precipitation-chemistry data-collection sites for which 3 or more years of data are available--Continued

Property or Constituent (Unit)	Summary Statistics: Sample Size	Maximum	Minimum	Mean	Percentage of Samples in Which Values Were Less than or Equal To Those Shown: 95	75	Median 50	25	5
Station Number 046a				Station Name Bennett Bridge, N.Y.					
HYDROGEN ION (mg/m^2)	64	22.75	0.64	6.4708	12.6675	7.9250	6.1850	4.3575	2.1550
SULFATE (g/m^2)	64	.96	.07	.3173	.6175	.3975	.2800	.2000	.1075
NITRATE (g/m^2)	64	.48	.05	.2392	.4575	.2900	.2300	.1700	.0900
CHLORIDE (g/m^2)	64	.045	.001	.0192	.0400	.0255	.0165	.0110	.0060
AMMONIUM (g/m^2)	64	.086	.007	.0401	.0772	.0497	.0380	.0285	.0135
SODIUM (g/m^2)	64	.0213	.0017	.0086	.0205	.0127	.0063	.0050	.0019
POTASSIUM (g/m^2)	64	.0109	.0008	.0034	.0082	.0041	.0030	.0022	.0012
CALCIUM (g/m^2)	64	.07	.004	.0204	.0517	.0230	.0165	.0122	.0052
MAGNESIUM (g/m^2)	64	.0178	.001	.0046	.0123	.0059	.0039	.0026	.0013
TOTAL PRECIPITATION (cm)	67	26.6	2.9	10.5597	18.3600	13.2000	10.2000	7.1000	4.3200
Station Number 047a				Station Name Jasper, N.Y.					
HYDROGEN ION (mg/m^2)	65	20.48	.07	3.4891	8.1460	4.8600	2.5300	1.4450	.3060
SULFATE (g/m^2)	65	1.1	0	.1751	.4310	.2250	.1400	.0700	.0200
NITRATE (g/m^2)	65	.46	.01	.1018	.2270	.1400	.0700	.0550	.0230
CHLORIDE (g/m^2)	65	.043	.001	.0082	.0204	.0110	.0060	.0040	.0020
AMMONIUM (g/m^2)	65	.064	0	.0154	.0471	.0220	.0110	.0050	.0013
SODIUM (g/m^2)	65	.034	.0005	.0046	.0142	.0045	.0029	.0018	.0006
POTASSIUM (g/m^2)	65	.0122	.0001	.0012	.0034	.0014	.0009	.0004	.0001
CALCIUM (g/m^2)	65	.049	.001	.0086	.0208	.0105	.0070	.0040	.0010
MAGNESIUM (g/m^2)	65	.0159	.0001	.0022	.0062	.0026	.0017	.0011	.0003
TOTAL PRECIPITATION (cm)	71	22.6	.2	6.1070	14.7400	8.5000	5.3000	3.1000	1.2400
Station Number 048a				Station Name Brookhaven, N.Y.					
HYDROGEN ION (mg/m^2)	90	16.89	.23	4.0062	9.1085	5.2875	3.5000	1.9175	.9195
SULFATE (g/m^2)	94	.63	.01	.1876	.4050	.2500	.1650	.0975	.0400
NITRATE (g/m^2)	94	.36	.02	.1114	.2325	.1500	.0950	.0575	.0300
CHLORIDE (g/m^2)	94	.848	.008	.1153	.3737	.1515	.0760	.0377	.0107
AMMONIUM (g/m^2)	94	.077	.002	.0178	.0482	.0242	.0130	.0070	.0030
SODIUM (g/m^2)	94	.4849	.0021	.0653	.1987	.0923	.0445	.0185	.0053
POTASSIUM (g/m^2)	94	.0379	.0002	.0046	.0158	.0057	.0032	.0019	.0008
CALCIUM (g/m^2)	94	.025	0	.0081	.0200	.0110	.0070	.0040	.0020
MAGNESIUM (g/m^2)	94	.0487	.0003	.0078	.0230	.0099	.0057	.0029	.0011
TOTAL PRECIPITATION (cm)	95	30.2	.1	8.8663	20.8000	12.0000	7.8000	4.4000	1.7000

Table 14.--Summary statistics for monthly ion-deposition data from precipitation-chemistry data-collection sites for which 3 or more years of data are available--Continued

Property or Constituent (Unit)	Summary Statistics: Sample Size	Maximum	Minimum	Mean	Percentage of Samples in Which Values Were Less than or Equal To Those Shown: 95	75	Median 50	25	5
Station Number 055a				Station Name Delaware, Ohio					
HYDROGEN ION (mg/m^2)	87	26.85	0.35	4.4771	12.9300	5.3100	3.3000	2.1200	0.4780
SULFATE (g/m^2)	87	1.35	.02	.2499	.6800	.3200	.1800	.1200	.0400
NITRATE (g/m^2)	87	.67	.02	.1408	.3300	.1800	.1000	.0800	.0340
CHLORIDE (g/m^2)	87	.07	.003	.0123	.0256	.0150	.0110	.0060	.0034
AMMONIUM (g/m^2)	87	.253	.001	.0288	.0768	.0330	.0190	.0100	.0030
SODIUM (g/m^2)	87	.0551	.0008	.0095	.0370	.0110	.0058	.0029	.0015
POTASSIUM (g/m^2)	87	.0522	.0001	.0029	.0066	.0026	.0016	.0008	.0002
CALCIUM (g/m^2)	87	.074	.001	.0172	.0486	.0220	.0140	.0070	.0030
MAGNESIUM (g/m^2)	87	.0116	.0002	.0034	.0082	.0041	.0030	.0017	.0008
TOTAL PRECIPITATION (cm)	87	29.5	.7	7.7126	18.9400	10.1000	6.2000	3.7000	1.2000
Station Number 056a				Station Name Caldwell, Ohio					
HYDROGEN ION (mg/m^2)	88	25.78	.03	5.8301	16.1665	7.2550	4.4700	2.8125	1.5650
SULFATE (g/m^2)	88	1.17	.02	.3074	.8010	.4025	.2400	.1425	.0700
NITRATE (g/m^2)	88	.48	.02	.1466	.3010	.1875	.1300	.0900	.0500
CHLORIDE (g/m^2)	88	.698	.003	.0249	.0427	.0207	.0145	.0100	.0050
AMMONIUM (g/m^2)	88	.07	.002	.0213	.0539	.0307	.0160	.0082	.0040
SODIUM (g/m^2)	88	.477	.0009	.0149	.0383	.0118	.0057	.0033	.0014
POTASSIUM (g/m^2)	88	.0496	.0003	.0029	.0089	.0029	.0018	.0010	.0004
CALCIUM (g/m^2)	88	.058	.002	.0188	.0440	.0240	.0170	.0100	.0040
MAGNESIUM (g/m^2)	88	.0104	.0007	.0035	.0077	.0049	.0030	.0018	.0009
TOTAL PRECIPITATION (cm)	88	30.9	1.6	8.3261	18.4100	10.9500	6.8500	4.5000	2.1450
Station Number 057a				Station Name Oxford, Ohio					
HYDROGEN ION (mg/m^2)	85	20.33	.07	4.4932	11.1770	5.7750	4.0200	2.1950	.9350
SULFATE (g/m^2)	88	.95	.01	.2340	.6010	.3000	.2000	.1125	.0345
NITRATE (g/m^2)	88	.36	.01	.1207	.2400	.1600	.1100	.0700	.0300
CHLORIDE (g/m^2)	88	.05	.002	.0158	.0360	.0205	.0140	.0080	.0034
AMMONIUM (g/m^2)	88	.084	.003	.0262	.0645	.0370	.0225	.0120	.0030
SODIUM (g/m^2)	88	.0208	.0002	.0058	.0146	.0080	.0047	.0024	.0007
POTASSIUM (g/m^2)	88	.0184	.0002	.0033	.0122	.0041	.0019	.0011	.0003
CALCIUM (g/m^2)	88	.069	.001	.0132	.0426	.0170	.0090	.0042	.0020
MAGNESIUM (g/m^2)	88	.0107	.0002	.0020	.0057	.0025	.0014	.0008	.0002
TOTAL PRECIPITATION (cm)	88	21.1	.4	7.8568	16.8200	11.5250	6.6500	4.3500	1.9000

Table 14.--Summary statistics for monthly ion-deposition data from precipitation-chemistry data-collection sites for which 3 or more years of data are available--Continued

Property or Constituent (Unit)	Summary Statistics: Sample Size	Maximum	Minimum	Mean	Percentage of Samples in Which Values Were Less than or Equal To Those Shown: 95	75	Median 50	25	5
Station Number 058a				Station Name Wooster, Ohio					
HYDROGEN ION (mg/m^2)	88	18.65	0.14	4.4594	9.6340	6.5300	3.4800	2.1825	1.1070
SULFATE (g/m^2)	88	.9	.04	.2555	.5310	.3600	.2000	.1300	.0600
NITRATE (g/m^2)	88	.45	.02	.1386	.3010	.2025	.1100	.0700	.0400
CHLORIDE (g/m^2)	88	.049	.003	.0133	.0295	.0170	.0110	.0070	.0040
AMMONIUM (g/m^2)	88	.084	.002	.0286	.0775	.0427	.0235	.0130	.0044
SODIUM (g/m^2)	88	.0818	.001	.0093	.0365	.0103	.0053	.0027	.0015
POTASSIUM (g/m^2)	88	.0081	.0002	.0019	.0056	.0025	.0014	.0008	.0004
CALCIUM (g/m^2)	88	.095	.001	.0165	.0375	.0220	.0140	.0080	.0034
MAGNESIUM (g/m^2)	88	.019	.0004	.0033	.0080	.0039	.0028	.0016	.0007
TOTAL PRECIPITATION (cm)	88	24.1	1	7.4693	15.3100	9.3750	6.5000	3.7250	2.2450
Station Number 063a				Station Name Kane, Pa.					
HYDROGEN ION (mg/m^2)	75	20.58	.48	7.5703	16.8520	9.6000	6.8300	4.0900	2.4440
SULFATE (g/m^2)	75	1.06	.04	.3561	.7420	.4800	.3100	.2000	.1100
NITRATE (g/m^2)	75	.51	.08	.2104	.4420	.2700	.2000	.1400	.0900
CHLORIDE (g/m^2)	75	.389	.001	.0237	.0378	.0260	.0170	.0120	.0060
AMMONIUM (g/m^2)	75	.13	.004	.0308	.0858	.0390	.0260	.0160	.0066
SODIUM (g/m^2)	75	.0834	.0019	.0107	.0404	.0126	.0067	.0041	.0020
POTASSIUM (g/m^2)	75	.0136	.0007	.0029	.0080	.0034	.0021	.0015	.0009
CALCIUM (g/m^2)	75	.063	.004	.0165	.0380	.0210	.0140	.0090	.0048
MAGNESIUM (g/m^2)	75	.0145	.0009	.0037	.0105	.0045	.0029	.0019	.0013
TOTAL PRECIPITATION (cm)	89	27.6	3.1	10.5989	19.5500	13.0500	10.2000	7.1000	4.5000
Station Number 064a				Station Name Leading Ridge, Pa.					
HYDROGEN ION (mg/m^2)	81	20.14	.83	5.8757	12.6100	8.0400	5.1300	2.7400	1.4130
SULFATE (g/m^2)	81	1.05	.03	.2865	.6590	.3950	.2300	.1350	.0600
NITRATE (g/m^2)	81	.42	.02	.1736	.3380	.2200	.1600	.1100	.0610
CHLORIDE (g/m^2)	81	.046	.006	.0177	.0356	.0210	.0160	.0115	.0071
AMMONIUM (g/m^2)	81	.09	.003	.0255	.0657	.0335	.0200	.0125	.0051
SODIUM (g/m^2)	81	.0852	.001	.0116	.0438	.0116	.0077	.0039	.0019
POTASSIUM (g/m^2)	81	.0208	.0003	.0036	.0113	.0043	.0024	.0016	.0009
CALCIUM (g/m^2)	81	.032	.003	.0141	.0299	.0195	.0140	.0075	.0040
MAGNESIUM (g/m^2)	81	.0103	.0007	.0031	.0061	.0040	.0029	.0020	.0010
TOTAL PRECIPITATION (cm)	81	23.9	2.1	8.8975	17.1600	11.4500	8.4000	5.2000	3.0100

Table 14.--Summary statistics for monthly ion-deposition data from precipitation-chemistry data-collection sites for which 3 or more years of data are available--Continued

Property or Constituent (Unit)	Summary Statistics				Percentage of Samples in Which Values Were Less than or Equal To Those Shown				
	Sample Size	Maxi-mum	Mini-mum	Mean	95	75	Median 50	25	5
Station Number 065a				Station Name Penn State, Pa.					
HYDROGEN ION (mg/m^2)	107	23.92	0.62	5.9855	14.5520	7.5600	4.9000	2.7000	1.2600
SULFATE (g/m^2)	112	1.24	.03	.2626	.6935	.3675	.1900	.1125	.0400
NITRATE (g/m^2)	112	.48	.04	.1587	.3205	.2100	.1400	.0925	.0500
CHLORIDE (g/m^2)	112	.074	.001	.0189	.0503	.0220	.0155	.0100	.0050
AMMONIUM (g/m^2)	112	.136	.002	.0252	.0650	.0347	.0185	.0100	.0040
SODIUM (g/m^2)	107	.0313	.0003	.0063	.0191	.0076	.0045	.0025	.0009
POTASSIUM (g/m^2)	107	.0336	.0002	.0038	.0132	.0043	.0023	.0013	.0005
CALCIUM (g/m^2)	101	.039	.002	.0114	.0250	.0150	.0090	.0060	.0030
MAGNESIUM (g/m^2)	100	.0106	.0002	.0018	.0041	.0023	.0015	.0008	.0003
TOTAL PRECIPITATION (cm)	112	22.7	1	8.3777	17.1350	11.0000	8.2000	4.7500	2.0650
Station Number 075a				Station Name Parsons, W. Va.					
HYDROGEN ION (mg/m^2)	90	21	1.15	6.4356	15.8870	8.9600	5.1000	2.9050	1.6555
SULFATE (g/m^2)	90	1.09	.07	.3407	.7580	.5000	.2750	.1775	.0855
NITRATE (g/m^2)	90	.48	0	.1774	.3800	.2125	.1600	.1100	.0655
CHLORIDE (g/m^2)	90	.049	.004	.0151	.0310	.0190	.0140	.0100	.0060
AMMONIUM (g/m^2)	90	.083	.002	.0249	.0627	.0362	.0205	.0090	.0055
SODIUM (g/m^2)	90	.0838	.0013	.0108	.0323	.0133	.0060	.0038	.0023
POTASSIUM (g/m^2)	90	.0192	.0004	.0037	.0084	.0043	.0030	.0020	.0013
CALCIUM (g/m^2)	90	.058	.004	.0228	.0513	.0302	.0205	.0130	.0080
MAGNESIUM (g/m^2)	90	.0087	.001	.0033	.0068	.0043	.0029	.0020	.0013
TOTAL PRECIPITATION (cm)	90	32.4	1.5	11.4100	20.6950	14.7000	10.4500	7.4750	4.7000
Station Number 143a				Station Name Longwoods (a), Ont.					
HYDROGEN ION (mg/m^2)	38	14	.18	5.0966	13.8860	6.1175	4.9150	3.0475	1.1205
SULFATE (g/m^2)	38	.73	.01	.2729	.5590	.3350	.2600	.1775	.0955
NITRATE (g/m^2)	38	.37	.02	.1934	.3605	.2250	.1900	.1500	.0770
CHLORIDE (g/m^2)	38	.055	.001	.0228	.0502	.0302	.0200	.0147	.0076
AMMONIUM (g/m^2)	38	.08	.002	.0366	.0657	.0472	.0355	.0245	.0134
SODIUM (g/m^2)	33	.0551	.0016	.0141	.0520	.0213	.0079	.0044	.0017
POTASSIUM (g/m^2)	38	.0138	.0001	.0037	.0096	.0041	.0031	.0024	.0012
CALCIUM (g/m^2)	38	.076	.002	.0334	.0722	.0480	.0295	.0187	.0077
MAGNESIUM (g/m^2)	38	.0129	.0003	.0055	.0126	.0077	.0045	.0031	.0013
TOTAL PRECIPITATION (cm)	38	15.7	.1	8.3105	14.6550	10.8000	9.0500	5.0750	3.1400

Table 14.--Summary statistics for monthly ion-deposition data from precipitation-chemistry data-collection sites for which 3 or more years of data are available--Continued

Property or Constituent (Unit)	Summary Statistics: Sample Size	Maximum	Minimum	Mean	Percentage of Samples in Which Values Were Less than or Equal To Those Shown: 95	75	Median 50	25	5
Station Number 143b				Station Name	Longwoods (b), Ont.				
HYDROGEN ION (mg/m^2)	58	11.55	0.91	4.8012	10.9005	6.4100	4.2800	2.7675	1.2795
SULFATE (g/m^2)	58	.7	.02	.2636	.5305	.3325	.2400	.1775	.0795
NITRATE (g/m^2)	58	.36	.06	.1781	.3125	.2200	.1750	.1275	.0700
CHLORIDE (g/m^2)	58	.038	.005	.0147	.0250	.0172	.0150	.0100	.0060
AMMONIUM (g/m^2)	58	.088	.001	.0378	.0713	.0530	.0345	.0237	.0099
SODIUM (g/m^2)	58	.0163	.0016	.0059	.0126	.0079	.0049	.0032	.0016
POTASSIUM (g/m^2)	58	.0102	.0003	.0041	.0093	.0061	.0035	.0024	.0005
CALCIUM (g/m^2)	58	.057	.003	.0239	.0482	.0292	.0240	.0150	.0049
MAGNESIUM (g/m^2)	58	.0091	.0005	.0043	.0082	.0056	.0044	.0024	.0007
TOTAL PRECIPITATION (cm)	66	15.9	1.9	8.0000	14.2600	10.6250	7.8000	5.0750	3.4350
Station Number 151a				Station Name	Scranton, Ohio				
HYDROGEN ION (mg/m^2)	75	12.53	.14	4.3713	9.2060	6.1000	3.9000	2.3200	1.0480
SULFATE (g/m^2)	75	.59	0	.1715	.4320	.2300	.1500	.0800	.0340
NITRATE (g/m^2)	75	.27	.01	.1132	.2320	.1500	.1000	.0700	.0280
CHLORIDE (g/m^2)	75	.036	.001	.0113	.0302	.0140	.0090	.0050	.0020
AMMONIUM (g/m^2)	75	.072	0	.0164	.0512	.0230	.0130	.0070	.0026
SODIUM (g/m^2)	75	.0352	-.0005	.0061	.0225	.0075	.0034	.0016	.0006
POTASSIUM (g/m^2)	69	.0109	-.0004	.0019	.0057	.0023	.0013	.0007	.0000
CALCIUM (g/m^2)	75	.019	0	.0065	.0164	.0090	.0060	.0030	.0008
MAGNESIUM (g/m^2)	75	.0045	.0001	.0013	.0033	.0017	.0011	.0005	.0002
TOTAL PRECIPITATION (cm)	75	24.8	.2	7.0693	15.7000	9.3000	6.2000	4.5000	1.6000
Station Number 153a				Station Name	Zanesville, Ohio				
HYDROGEN ION (mg/m^2)	84	31.01	.78	6.5043	15.8525	8.5850	5.3150	3.1025	1.4700
SULFATE (g/m^2)	84	1.21	.02	.2704	.6300	.3500	.2350	.1225	.0425
NITRATE (g/m^2)	84	.45	.02	.1498	.3175	.2075	.1300	.0800	.0425
CHLORIDE (g/m^2)	84	.088	.002	.0177	.0485	.0217	.0130	.0080	.0040
AMMONIUM (g/m^2)	84	.092	.004	.0267	.0670	.0415	.0190	.0112	.0052
SODIUM (g/m^2)	84	.0965	.0007	.0092	.0254	.0123	.0048	.0023	.0013
POTASSIUM (g/m^2)	69	.0177	.0002	.0029	.0114	.0037	.0017	.0008	.0003
CALCIUM (g/m^2)	84	.1	.003	.0190	.0470	.0280	.0145	.0080	.0032
MAGNESIUM (g/m^2)	84	.0087	.0004	.0025	.0066	.0034	.0019	.0010	.0004
TOTAL PRECIPITATION (cm)	84	32.2	1	9.0845	20.8500	12.3500	7.6500	4.2000	2.2250

Table 14.--Summary statistics for monthly ion-deposition data from precipitation-chemistry data-collection sites for which 3 or more years of data are available--Continued

Property or Constituent (Unit)	Sample Size	Maximum	Minimum	Mean	95	75	Median 50	25	5
	Summary Statistics				Percentage of Samples in Which Values Were Less than or Equal To Those Shown				
Station Number 154a				Station Name Rockport, Ind.					
HYDROGEN ION (mg/m^2)	84	17.84	0.5	5.6986	13.2125	7.6750	4.9700	3.0700	1.3725
SULFATE (g/m^2)	84	.82	.01	.2656	.6450	.3675	.2250	.1300	.0600
NITRATE (g/m^2)	84	.33	.02	.1192	.2575	.1575	.1100	.0600	.0325
CHLORIDE (g/m^2)	84	.092	.001	.0176	.0502	.0210	.0125	.0072	.0030
AMMONIUM (g/m^2)	84	.104	.002	.0296	.0740	.0387	.0220	.0132	.0050
SODIUM (g/m^2)	84	.5149	-.0002	.0149	.0266	.0108	.0059	.0027	.0006
POTASSIUM (g/m^2)	69	.0359	-.0006	.0044	.0158	.0047	.0024	.0013	.0004
CALCIUM (g/m^2)	84	.07	.001	.0169	.0450	.0230	.0130	.0080	.0022
MAGNESIUM (g/m^2)	84	.0105	.0002	.0024	.0069	.0031	.0018	.0011	.0002
TOTAL PRECIPITATION (cm)	84	31.2	1	9.7179	20.2750	13.1750	8.9000	5.5000	2.1750
Station Number 156a				Station Name Fort Wayne, Ind.					
HYDROGEN ION (mg/m^2)	83	11.11	.02	4.1619	9.8600	5.6600	3.7500	2.3100	.4560
SULFATE (g/m^2)	83	.56	0	.2243	.4780	.2900	.2100	.1300	.0400
NITRATE (g/m^2)	83	.32	.01	.1412	.2780	.1800	.1300	.0900	.0400
CHLORIDE (g/m^2)	83	.046	.001	.0114	.0248	.0150	.0100	.0060	.0030
AMMONIUM (g/m^2)	83	.101	.001	.0333	.0738	.0450	.0300	.0190	.0054
SODIUM (g/m^2)	83	.0414	.0002	.0057	.0142	.0069	.0044	.0023	.0006
POTASSIUM (g/m^2)	68	.0261	.0002	.0028	.0079	.0034	.0019	.0013	.0003
CALCIUM (g/m^2)	83	.071	.001	.0211	.0498	.0280	.0180	.0110	.0040
MAGNESIUM (g/m^2)	83	.0208	.0002	.0049	.0128	.0059	.0037	.0025	.0008
TOTAL PRECIPITATION (cm)	84	17.7	.6	7.7095	14.0250	10.6000	7.4500	4.8250	1.3000
Station Number 168a				Station Name Huntington, N.Y.					
HYDROGEN ION (mg/m^2)	82	12.34	.64	3.7568	8.2940	4.9400	3.1600	2.2550	1.1375
SULFATE (g/m^2)	82	.59	.03	.1823	.3985	.2425	.1600	.0900	.0415
NITRATE (g/m^2)	82	.61	.02	.1288	.2100	.1500	.1200	.0900	.0500
CHLORIDE (g/m^2)	82	.07	.001	.0104	.0271	.0120	.0080	.0060	.0030
AMMONIUM (g/m^2)	82	.088	.001	.0187	.0458	.0245	.0160	.0080	.0021
SODIUM (g/m^2)	82	.0403	.0008	.0072	.0236	.0083	.0044	.0029	.0014
POTASSIUM (g/m^2)	82	.0063	.0002	.0016	.0044	.0020	.0013	.0009	.0005
CALCIUM (g/m^2)	82	.041	.002	.0099	.0218	.0130	.0080	.0050	.0021
MAGNESIUM (g/m^2)	82	.0111	.0003	.0024	.0056	.0030	.0020	.0013	.0006
TOTAL PRECIPITATION (cm)	86	22	1.9	8.3884	15.0600	10.5250	7.9500	5.8250	2.8750

Table 14.--Summary statistics for monthly ion-deposition data from precipitation-chemistry data-collection sites for which 3 or more years of data are available--Continued

Property or Constituent (Unit)	Summary Statistics: Sample Size	Maximum	Minimum	Mean	Percentage of Samples in Which Values Were Less than or Equal To Those Shown: 95	75	Median 50	25	5
Station Number 176a				Station Name Colchester, Ont.					
HYDROGEN ION (mg/m^2)	56	15.43	0.82	4.9221	12.6190	6.2000	4.2750	2.2450	0.8640
SULFATE (g/m^2)	59	1.72	.05	.3369	.8400	.4000	.2700	.1600	.0900
NITRATE (g/m^2)	57	.91	.05	.1930	.3900	.2400	.1500	.1200	.0690
CHLORIDE (g/m^2)	57	.091	.004	.0203	.0502	.0245	.0170	.0125	.0050
AMMONIUM (g/m^2)	58	.488	.005	.0532	.1423	.0632	.0395	.0200	.0109
SODIUM (g/m^2)	53	.0581	.0011	.0077	.0277	.0081	.0050	.0031	.0014
POTASSIUM (g/m^2)	53	.0515	.0003	.0048	.0146	.0054	.0029	.0016	.0005
CALCIUM (g/m^2)	54	.166	.003	.0379	.0945	.0452	.0280	.0157	.0097
MAGNESIUM (g/m^2)	54	.0368	.0014	.0089	.0251	.0102	.0067	.0040	.0023
TOTAL PRECIPITATION (cm)	64	29	1.6	7.1469	13.8750	10.2250	6.7500	3.6250	1.8250
Station Number 177a				Station Name Merlin, Ont.					
HYDROGEN ION (mg/m^2)	55	13.19	.31	4.6673	12.4220	6.5800	4.2600	2.1300	.4540
SULFATE (g/m^2)	59	.87	.05	.3161	.7300	.4200	.2600	.1900	.0800
NITRATE (g/m^2)	60	.4	.05	.1972	.3785	.2700	.1700	.1300	.0705
CHLORIDE (g/m^2)	58	.126	.002	.0212	.0498	.0240	.0175	.0120	.0049
AMMONIUM (g/m^2)	59	.124	.004	.0438	.1120	.0660	.0340	.0220	.0060
SODIUM (g/m^2)	55	.0837	.001	.0097	.0370	.0109	.0060	.0027	.0012
POTASSIUM (g/m^2)	57	.0158	.0001	.0039	.0113	.0056	.0024	.0016	.0005
CALCIUM (g/m^2)	52	.136	.009	.0454	.1247	.0560	.0370	.0270	.0143
MAGNESIUM (g/m^2)	52	.0552	.0016	.0094	.0263	.0106	.0069	.0047	.0018
TOTAL PRECIPITATION (cm)	64	16.5	1.1	7.2187	14.8750	9.2250	6.8000	4.9250	1.3500
Station Number 178a				Station Name Port Stanley, Ont.					
HYDROGEN ION (mg/m^2)	48	20.06	.25	6.2083	18.2060	8.3300	4.8500	3.2575	.6480
SULFATE (g/m^2)	56	1.3	.08	.3582	.9540	.4425	.2900	.2000	.0970
NITRATE (g/m^2)	55	.62	.06	.2298	.5280	.2700	.2100	.1500	.0700
CHLORIDE (g/m^2)	56	.067	.003	.0180	.0427	.0227	.0150	.0102	.0048
AMMONIUM (g/m^2)	52	.173	.004	.0492	.1214	.0697	.0405	.0240	.0096
SODIUM (g/m^2)	51	.0387	.0006	.0062	.0176	.0072	.0053	.0024	.0009
POTASSIUM (g/m^2)	50	.0165	.0005	.0040	.0134	.0050	.0029	.0018	.0008
CALCIUM (g/m^2)	45	.139	.006	.0379	.1025	.0500	.0290	.0190	.0079
MAGNESIUM (g/m^2)	49	.042	.0004	.0078	.0247	.0094	.0056	.0038	.0012
TOTAL PRECIPITATION (cm)	64	24.2	1.5	7.7984	17.6500	9.8750	6.6500	4.3500	1.8750

Table 14.--Summary statistics for monthly ion-deposition data from precipitation-chemistry data-collection sites for which 3 or more years of data are available--Continued

Property or Constituent (Unit)	Summary Statistics: Sample Size	Summary Statistics: Maximum	Summary Statistics: Minimum	Summary Statistics: Mean	Percentage of Samples in Which Values Were Less than or Equal To Those Shown: 95	75	Median 50	25	5
Station Number 179a				Station Name Wilkesport, Ont.					
HYDROGEN ION (mg/m^2)	53	16.56	0.17	4.5966	13.6950	5.9950	3.8100	2.1250	0.2790
SULFATE (g/m^2)	60	1.23	.06	.3210	.8285	.3800	.2500	.1600	.0815
NITRATE (g/m^2)	58	.69	.04	.2005	.4655	.2300	.1800	.1200	.0690
CHLORIDE (g/m^2)	56	.057	.001	.0191	.0401	.0247	.0170	.0122	.0067
AMMONIUM (g/m^2)	54	.141	.003	.0540	.1307	.0777	.0430	.0277	.0087
SODIUM (g/m^2)	52	.0199	.0006	.0066	.0169	.0083	.0053	.0032	.0018
POTASSIUM (g/m^2)	53	.0142	.0003	.0043	.0128	.0058	.0031	.0018	.0004
CALCIUM (g/m^2)	48	.189	.012	.0432	.1092	.0477	.0365	.0230	.0134
MAGNESIUM (g/m^2)	52	.0231	.0018	.0063	.0172	.0069	.0054	.0037	.0021
TOTAL PRECIPITATION (cm)	64	19.4	.9	6.6422	15.5500	9.0000	6.1000	3.7250	1.5500
Station Number 180a				Station Name Alvinston, Ont.					
HYDROGEN ION (mg/m^2)	56	13.58	.03	4.4607	12.3945	6.2850	3.2250	2.1600	.1600
SULFATE (g/m^2)	57	.88	.09	.3098	.7600	.4150	.2500	.1650	.1100
NITRATE (g/m^2)	57	.44	.07	.2028	.3820	.2600	.1800	.1350	.0790
CHLORIDE (g/m^2)	57	.044	.003	.0169	.0336	.0200	.0160	.0090	.0058
AMMONIUM (g/m^2)	57	.135	.005	.0458	.1059	.0585	.0390	.0260	.0086
SODIUM (g/m^2)	55	.0244	.0015	.0064	.0168	.0086	.0048	.0028	.0017
POTASSIUM (g/m^2)	55	.0471	.0002	.0066	.0242	.0081	.0042	.0022	.0002
CALCIUM (g/m^2)	50	.107	.01	.0426	.1014	.0612	.0335	.0190	.0115
MAGNESIUM (g/m^2)	53	.0283	.0016	.0078	.0189	.0104	.0060	.0037	.0019
TOTAL PRECIPITATION (cm)	64	20.5	1.4	7.8547	15.9750	10.7250	7.6000	4.0500	2.2750
Station Number 181a				Station Name Shallow Lake, Ont.					
HYDROGEN ION (mg/m^2)	54	13.4	1.11	4.7019	11.2525	5.7450	4.2850	2.7325	1.1875
SULFATE (g/m^2)	55	.63	.04	.2667	.5460	.3400	.2500	.1800	.0820
NITRATE (g/m^2)	56	.4	.05	.2020	.3305	.2500	.2000	.1600	.0685
CHLORIDE (g/m^2)	54	.041	.002	.0118	.0305	.0140	.0120	.0060	.0020
AMMONIUM (g/m^2)	55	.092	.009	.0489	.0854	.0640	.0470	.0340	.0132
SODIUM (g/m^2)	54	.0218	.0004	.0047	.0174	.0060	.0037	.0020	.0006
POTASSIUM (g/m^2)	52	.0114	.0001	.0030	.0094	.0041	.0024	.0012	.0002
CALCIUM (g/m^2)	54	.064	.003	.0247	.0565	.0325	.0230	.0130	.0052
MAGNESIUM (g/m^2)	54	.0141	.0006	.0050	.0113	.0066	.0049	.0028	.0010
TOTAL PRECIPITATION (cm)	63	17.8	1.9	8.4254	15.2200	11.1000	7.9000	5.8000	2.5200

Table 14.--Summary statistics for monthly ion-deposition data from precipitation-chemistry data-collection sites for which 3 or more years of data are available--Continued

Property or Constituent (Unit)	Summary Statistics: Sample Size	Maximum	Minimum	Mean	Percentage of Samples in Which Values Were Less than or Equal To Those Shown: 95	75	Median 50	25	5
Station Number 182a				Station Name Palmerston, Ont.					
HYDROGEN ION (mg/m^2)	49	14.53	0.19	3.3629	9.5050	4.7050	2.4800	1.4200	0.4850
SULFATE (g/m^2)	57	1.06	.05	.2868	.6480	.3550	.2300	.1650	.0790
NITRATE (g/m^2)	59	.45	.05	.1853	.3400	.2300	.1800	.1300	.0600
CHLORIDE (g/m^2)	58	.066	0	.0144	.0490	.0180	.0120	.0070	.0030
AMMONIUM (g/m^2)	58	.163	.01	.0608	.1364	.0765	.0530	.0355	.0196
SODIUM (g/m^2)	57	.0363	.0004	.0060	.0177	.0073	.0045	.0023	.0008
POTASSIUM (g/m^2)	55	.0247	.0001	.0036	.0093	.0045	.0031	.0016	.0005
CALCIUM (g/m^2)	51	.113	.005	.0340	.0778	.0470	.0300	.0170	.0080
MAGNESIUM (g/m^2)	54	.0356	.0009	.0087	.0253	.0111	.0072	.0038	.0020
TOTAL PRECIPITATION (cm)	64	22.5	1.7	7.5609	15.3750	9.8750	7.0500	4.3500	2.3000
Station Number 183a				Station Name Huron Park, Ont.					
HYDROGEN ION (mg/m^2)	38	11.23	.23	3.5921	10.1945	4.9175	3.0300	1.2625	.2585
SULFATE (g/m^2)	44	1.03	.04	.3066	.6675	.4150	.2500	.1600	.0525
NITRATE (g/m^2)	43	.5	.04	.2028	.4680	.2600	.1900	.1300	.0600
CHLORIDE (g/m^2)	43	.048	.003	.0146	.0394	.0180	.0130	.0080	.0040
AMMONIUM (g/m^2)	42	.172	.006	.0539	.1424	.0762	.0435	.0300	.0100
SODIUM (g/m^2)	42	.0188	.0005	.0051	.0149	.0069	.0037	.0027	.0008
POTASSIUM (g/m^2)	40	.0109	0	.0026	.0070	.0034	.0020	.0010	.0002
CALCIUM (g/m^2)	38	.192	.007	.0511	.1863	.0632	.0400	.0220	.0098
MAGNESIUM (g/m^2)	40	.0378	.001	.0087	.0225	.0108	.0066	.0037	.0015
TOTAL PRECIPITATION (cm)	49	17.6	1.3	7.4633	16.2000	10.8000	6.6000	3.5000	2.0000
Station Number 184a				Station Name Waterloo, Ont.					
HYDROGEN ION (mg/m^2)	48	16.09	.32	4.1650	10.8455	5.4125	3.4550	1.9300	.4580
SULFATE (g/m^2)	52	1.67	.06	.3137	.7835	.3400	.2300	.1800	.0765
NITRATE (g/m^2)	52	.48	.01	.1915	.4005	.2650	.1600	.1300	.0630
CHLORIDE (g/m^2)	52	.046	.001	.0160	.0362	.0210	.0150	.0100	.0050
AMMONIUM (g/m^2)	47	.228	.005	.0570	.1770	.0760	.0420	.0290	.0100
SODIUM (g/m^2)	52	.0248	.0009	.0061	.0128	.0087	.0055	.0030	.0014
POTASSIUM (g/m^2)	51	.029	.0002	.0040	.0192	.0047	.0020	.0009	.0003
CALCIUM (g/m^2)	50	.121	.003	.0319	.0798	.0422	.0250	.0150	.0070
MAGNESIUM (g/m^2)	51	.029	.0004	.0074	.0215	.0090	.0048	.0033	.0010
TOTAL PRECIPITATION (cm)	64	20.7	2.2	7.9016	16.8500	9.5000	7.1500	5.0000	2.7750

Table 14.--Summary statistics for monthly ion-deposition data from precipitation-chemistry data-collection sites for which 3 or more years of data are available--Continued

Property or Constituent (Unit)	Summary Statistics: Sample Size	Maximum	Minimum	Mean	Percentage of Samples in Which Values Were Less than or Equal To Those Shown: 95	75	Median 50	25	5
Station Number 186a				Station Name	Milton, Ont.				
HYDROGEN ION (mg/m^2)	16	15.54	0.43	4.0331	15.5400	5.6400	3.4100	1.6150	0.4300
SULFATE (g/m^2)	32	1.28	.04	.3528	.9745	.4200	.2950	.1875	.0465
NITRATE (g/m^2)	31	.7	.04	.2190	.5380	.2300	.1900	.1300	.0700
CHLORIDE (g/m^2)	28	.076	.005	.0265	.0692	.0312	.0205	.0150	.0068
AMMONIUM (g/m^2)	32	.226	.007	.0621	.1746	.0942	.0500	.0270	.0076
SODIUM (g/m^2)	28	.0407	.0012	.0102	.0397	.0112	.0071	.0035	.0012
POTASSIUM (g/m^2)	30	.0468	.0001	.0069	.0366	.0079	.0034	.0014	.0002
CALCIUM (g/m^2)	19	.172	.011	.0551	.1720	.0590	.0460	.0320	.0110
MAGNESIUM (g/m^2)	13	.0593	.0025	.0162	.0593	.0203	.0116	.0060	.0025
TOTAL PRECIPITATION (cm)	43	18.7	1.7	6.8651	14.7600	8.6000	6.3000	4.7000	1.8400
Station Number 187a				Station Name	Uxbridge, Ont.				
HYDROGEN ION (mg/m^2)	44	12.7	.02	3.8839	10.6750	4.9450	3.2500	2.0450	.2100
SULFATE (g/m^2)	50	.8	.01	.2790	.6435	.3625	.2350	.1575	.1000
NITRATE (g/m^2)	51	.49	0	.1908	.4040	.2600	.1600	.1200	.0660
CHLORIDE (g/m^2)	50	.081	0	.0161	.0600	.0180	.0120	.0090	.0030
AMMONIUM (g/m^2)	50	.134	.001	.0426	.0894	.0605	.0370	.0215	.0107
SODIUM (g/m^2)	47	.0464	.0001	.0063	.0256	.0071	.0043	.0021	.0004
POTASSIUM (g/m^2)	46	.0135	0	.0032	.0098	.0046	.0028	.0011	.0002
CALCIUM (g/m^2)	38	.224	.001	.0441	.1736	.0512	.0305	.0170	.0086
MAGNESIUM (g/m^2)	46	.0184	.0001	.0056	.0173	.0068	.0049	.0026	.0005
TOTAL PRECIPITATION (cm)	63	17	.2	7.2794	12.4600	10.0000	7.1000	4.5000	2.2600
Station Number 189a				Station Name	Campbellford, Ont.				
HYDROGEN ION (mg/m^2)	53	14.32	.52	3.6517	9.7650	4.4450	2.8300	2.0900	.6200
SULFATE (g/m^2)	57	.88	.01	.2537	.7500	.3200	.2100	.1300	.0600
NITRATE (g/m^2)	58	.64	.02	.1829	.3810	.2225	.1600	.1200	.0795
CHLORIDE (g/m^2)	56	.04	.002	.0127	.0314	.0150	.0120	.0072	.0037
AMMONIUM (g/m^2)	55	.17	.001	.0425	.1216	.0520	.0350	.0180	.0084
SODIUM (g/m^2)	56	.0248	.0004	.0052	.0112	.0068	.0045	.0025	.0007
POTASSIUM (g/m^2)	51	.0388	.0001	.0045	.0141	.0062	.0029	.0013	.0002
CALCIUM (g/m^2)	50	.195	.002	.0369	.1405	.0382	.0275	.0135	.0065
MAGNESIUM (g/m^2)	56	.0227	.0001	.0043	.0150	.0056	.0035	.0014	.0003
TOTAL PRECIPITATION (cm)	64	19	.4	7.0953	16.2500	9.0750	6.9500	3.7500	2.2750

Table 14.--Summary statistics for monthly ion-deposition data from precipitation-chemistry data-collection sites for which 3 or more years of data are available--Continued

Property or Constituent (Unit)	Summary Statistics: Sample Size	Maximum	Minimum	Mean	Percentage of Samples in Which Values Were Less than or Equal To Those Shown: 95	75	Median 50	25	5
Station Number 190a Station Name Coldwater, Ont.									
HYDROGEN ION (mg/m^2)	44	11.14	0.51	3.7693	10.5575	4.8825	3.0650	1.8400	0.9025
SULFATE (g/m^2)	46	.83	.04	.2222	.5295	.2875	.1800	.1200	.0535
NITRATE (g/m^2)	47	.4	.06	.1660	.3080	.2100	.1600	.1100	.0700
CHLORIDE (g/m^2)	48	.037	.003	.0137	.0265	.0187	.0130	.0080	.0040
AMMONIUM (g/m^2)	46	.234	.008	.0427	.1071	.0542	.0270	.0160	.0090
SODIUM (g/m^2)	47	.0156	.0007	.0055	.0121	.0077	.0044	.0028	.0012
POTASSIUM (g/m^2)	44	.0255	.0001	.0044	.0155	.0054	.0022	.0011	.0001
CALCIUM (g/m^2)	48	.111	.004	.0243	.0577	.0355	.0190	.0120	.0054
MAGNESIUM (g/m^2)	47	.0195	.0002	.0040	.0146	.0055	.0028	.0015	.0004
TOTAL PRECIPITATION (cm)	52	24.3	1.9	7.9423	14.5400	9.9500	6.7500	5.6250	3.7650
Station Number 192a Station Name Smiths Falls, Ont.									
HYDROGEN ION (mg/m^2)	49	15.49	.22	3.2543	9.6300	4.4000	2.5900	1.3750	.4950
SULFATE (g/m^2)	59	.7	.02	.2132	.6400	.2900	.1600	.1100	.0300
NITRATE (g/m^2)	60	.42	.01	.1523	.3190	.1800	.1400	.1100	.0310
CHLORIDE (g/m^2)	56	.032	0	.0111	.0271	.0140	.0100	.0070	.0018
AMMONIUM (g/m^2)	59	.096	.003	.0304	.0900	.0450	.0240	.0120	.0040
SODIUM (g/m^2)	55	.0184	.0002	.0054	.0162	.0071	.0045	.0024	.0009
POTASSIUM (g/m^2)	52	.0092	.0001	.0029	.0087	.0044	.0019	.0011	.0002
CALCIUM (g/m^2)	49	.091	.002	.0286	.0805	.0430	.0220	.0120	.0030
MAGNESIUM (g/m^2)	35	.0208	.0003	.0058	.0168	.0070	.0042	.0017	.0004
TOTAL PRECIPITATION (cm)	64	19	.4	6.7109	12.9250	8.8750	6.0500	3.8000	1.4000
Station Number 221a Station Name Melbourne, Ont.									
HYDROGEN ION (mg/m^2)	55	14.36	.77	4.6675	10.9460	5.5800	4.0900	2.6000	1.2000
SULFATE (g/m^2)	54	.72	.06	.2472	.5450	.3225	.2200	.1300	.0675
NITRATE (g/m^2)	54	.38	.06	.1719	.3100	.2200	.1700	.1075	.0700
CHLORIDE (g/m^2)	54	.028	.004	.0134	.0260	.0172	.0125	.0090	.0047
AMMONIUM (g/m^2)	54	.103	.009	.0346	.0817	.0480	.0270	.0197	.0100
SODIUM (g/m^2)	54	.0181	.0006	.0056	.0149	.0070	.0047	.0027	.0007
POTASSIUM (g/m^2)	54	.0094	.0003	.0034	.0078	.0048	.0028	.0016	.0007
CALCIUM (g/m^2)	54	.074	.002	.0220	.0532	.0280	.0180	.0130	.0047
MAGNESIUM (g/m^2)	54	.0123	.0005	.0038	.0099	.0045	.0031	.0023	.0008
TOTAL PRECIPITATION (cm)	62	16.1	1.6	7.4403	14.6100	10.4250	6.7500	4.6750	2.0000

Table 14.--Summary statistics for monthly ion-deposition data from precipitation-chemistry data-collection sites for which 3 or more years of data are available--Continued

Property or Constituent (Unit)	Summary Statistics: Sample Size	Maximum	Minimum	Mean	Percentage of Samples in Which Values Were Less than or Equal To Those Shown: 95	75	Median 50	25	5
Station Number 222a				Station Name North Easthope, Ont.					
HYDROGEN ION (mg/m^2)	55	15.1	1.13	4.3236	8.7120	5.1400	3.4500	2.7100	1.2820
SULFATE (g/m^2)	55	.87	.03	.2649	.4760	.3200	.2500	.1600	.0760
NITRATE (g/m^2)	55	.37	.06	.1811	.3000	.2300	.1800	.1300	.0700
CHLORIDE (g/m^2)	55	.045	.005	.0151	.0284	.0190	.0130	.0090	.0060
AMMONIUM (g/m^2)	55	.116	.005	.0444	.0896	.0560	.0390	.0290	.0114
SODIUM (g/m^2)	54	.0227	.0014	.0059	.0172	.0079	.0046	.0028	.0017
POTASSIUM (g/m^2)	54	.0229	.0008	.0045	.0121	.0058	.0035	.0025	.0012
CALCIUM (g/m^2)	54	.096	.004	.0258	.0482	.0340	.0245	.0157	.0050
MAGNESIUM (g/m^2)	54	.0298	.0007	.0053	.0101	.0067	.0047	.0030	.0009
TOTAL PRECIPITATION (cm)	62	16	1.9	8.4935	14.9850	11.3250	8.2500	5.4250	3.2300
Station Number 223a				Station Name Wellesley, Ont.					
HYDROGEN ION (mg/m^2)	51	12.71	1.51	4.6151	11.1360	5.8900	3.7100	2.7400	1.8860
SULFATE (g/m^2)	51	.68	.05	.2590	.6100	.3000	.2400	.1500	.0860
NITRATE (g/m^2)	51	.35	.07	.1775	.3240	.2100	.1800	.1300	.0760
CHLORIDE (g/m^2)	51	.072	.004	.0131	.0326	.0160	.0100	.0070	.0040
AMMONIUM (g/m^2)	51	.085	.012	.0411	.0754	.0520	.0390	.0250	.0126
SODIUM (g/m^2)	51	.018	.0006	.0041	.0108	.0057	.0032	.0019	.0011
POTASSIUM (g/m^2)	51	.0054	.0002	.0020	.0040	.0028	.0016	.0012	.0005
CALCIUM (g/m^2)	51	.059	.003	.0199	.0502	.0260	.0160	.0120	.0046
MAGNESIUM (g/m^2)	51	.0124	.0007	.0040	.0109	.0051	.0033	.0022	.0008
TOTAL PRECIPITATION (cm)	60	16.6	.4	8.5483	14.8850	11.2250	7.7500	5.8000	3.6050
Station Number 225a				Station Name Balsam Lake, Ont.					
HYDROGEN ION (mg/m^2)	53	10.73	.61	4.0555	9.7820	5.6650	3.3700	2.1600	.7530
SULFATE (g/m^2)	53	.54	.01	.2009	.4730	.2450	.1800	.1100	.0270
NITRATE (g/m^2)	53	.29	.02	.1462	.2690	.1950	.1300	.0950	.0540
CHLORIDE (g/m^2)	53	.031	.002	.0107	.0209	.0140	.0100	.0065	.0037
AMMONIUM (g/m^2)	53	.123	0	.0284	.0679	.0385	.0220	.0145	.0041
SODIUM (g/m^2)	53	.0201	.0005	.0044	.0098	.0064	.0034	.0019	.0006
POTASSIUM (g/m^2)	53	.0147	.0001	.0029	.0127	.0029	.0019	.0010	.0005
CALCIUM (g/m^2)	53	.078	.001	.0179	.0409	.0245	.0140	.0100	.0030
MAGNESIUM (g/m^2)	53	.0109	.0001	.0026	.0068	.0031	.0020	.0013	.0004
TOTAL PRECIPITATION (cm)	62	26.1	.9	7.4403	13.1000	9.6500	6.7000	4.6500	2.1500

Table 14.--Summary statistics for monthly ion-deposition data from precipitation-chemistry data-collection sites for which 3 or more years of data are available--Continued

Property or Constituent (Unit)	Sample Size	Maximum	Minimum	Mean	95	75	Median 50	25	5
	Summary Statistics				Percentage of Samples in Which Values Were Less than or Equal To Those Shown				
Station Number 226a				Station Name Raven Lake, Ont.					
HYDROGEN ION (mg/m^2)	50	12.28	1.48	4.4640	10.3170	5.7075	4.0000	2.4725	1.5860
SULFATE (g/m^2)	50	.55	.05	.2210	.5025	.2550	.2150	.1300	.0555
NITRATE (g/m^2)	50	.3	.07	.1682	.2845	.2225	.1600	.1100	.0755
CHLORIDE (g/m^2)	50	.024	.004	.0121	.0209	.0150	.0110	.0087	.0050
AMMONIUM (g/m^2)	50	.072	.006	.0317	.0655	.0450	.0275	.0167	.0075
SODIUM (g/m^2)	50	.0131	.0006	.0046	.0103	.0062	.0039	.0026	.0010
POTASSIUM (g/m^2)	50	.0061	.0005	.0026	.0055	.0035	.0023	.0016	.0006
CALCIUM (g/m^2)	50	.063	.002	.0179	.0427	.0232	.0150	.0100	.0055
MAGNESIUM (g/m^2)	50	.0111	.0005	.0028	.0063	.0037	.0021	.0014	.0006
TOTAL PRECIPITATION (cm)	59	21.7	2.2	7.8729	13.9000	9.8000	7.3000	5.5000	3.3000
Station Number 227a				Station Name Charleston Lake, Ont.					
HYDROGEN ION (mg/m^2)	51	10.69	.79	4.3537	9.4600	6.0400	3.8200	2.6500	1.2820
SULFATE (g/m^2)	51	.41	.04	.1961	.3900	.2500	.1900	.1300	.0400
NITRATE (g/m^2)	51	.3	.03	.1480	.2580	.2100	.1400	.0900	.0360
CHLORIDE (g/m^2)	51	.027	.001	.0095	.0236	.0110	.0080	.0060	.0036
AMMONIUM (g/m^2)	51	.053	.005	.0263	.0518	.0360	.0250	.0170	.0066
SODIUM (g/m^2)	51	.031	.0003	.0042	.0142	.0052	.0027	.0014	.0005
POTASSIUM (g/m^2)	51	.0081	.0001	.0019	.0047	.0025	.0015	.0010	.0002
CALCIUM (g/m^2)	51	.025	.001	.0115	.0240	.0150	.0110	.0070	.0020
MAGNESIUM (g/m^2)	51	.0084	.0003	.0021	.0052	.0025	.0017	.0013	.0004
TOTAL PRECIPITATION (cm)	60	16.1	.1	7.7700	14.3000	10.2250	7.6000	5.0500	2.2050
Station Number 228a				Station Name Railton, Ont.					
HYDROGEN ION (mg/m^2)	55	10.71	.76	4.5493	9.7240	6.0700	3.9700	2.2800	1.1760
SULFATE (g/m^2)	55	.58	.03	.2255	.4780	.3100	.2000	.1300	.0680
NITRATE (g/m^2)	56	.4	.04	.1598	.3215	.2100	.1500	.1025	.0585
CHLORIDE (g/m^2)	56	.034	.001	.0118	.0286	.0157	.0105	.0060	.0030
AMMONIUM (g/m^2)	55	.104	.001	.0336	.0646	.0480	.0310	.0170	.0088
SODIUM (g/m^2)	55	.0214	.0001	.0053	.0138	.0069	.0046	.0024	.0007
POTASSIUM (g/m^2)	54	.0117	.0003	.0027	.0070	.0034	.0027	.0011	.0004
CALCIUM (g/m^2)	55	.052	.001	.0180	.0464	.0220	.0160	.0100	.0038
MAGNESIUM (g/m^2)	55	.0125	.0003	.0026	.0060	.0033	.0021	.0012	.0005
TOTAL PRECIPITATION (cm)	66	19.3	1.2	7.6258	13.6500	9.6250	7.7500	4.9250	1.9400

Table 14.--Summary statistics for monthly ion-deposition data from precipitation-chemistry data-collection sites for which 3 or more years of data are available--Continued

Property or Constituent (Unit)	Summary Statistics: Sample Size	Maximum	Minimum	Mean	Percentage of Samples in Which Values Were Less than or Equal To Those Shown: 95	75	Median 50	25	5
Station Number 229a				Station Name Graham Lake, Ont.					
HYDROGEN ION (mg/m^2)	55	10.8	0.58	4.0638	8.4920	5.6400	3.4600	2.1300	0.7160
SULFATE (g/m^2)	55	.56	.03	.2120	.4300	.2900	.2000	.1100	.0400
NITRATE (g/m^2)	55	.47	.02	.1675	.3740	.2100	.1600	.1000	.0500
CHLORIDE (g/m^2)	55	.252	.003	.0176	.0408	.0160	.0110	.0080	.0048
AMMONIUM (g/m^2)	55	.121	.005	.0342	.0666	.0450	.0320	.0170	.0082
SODIUM (g/m^2)	55	.2397	.0001	.0109	.0298	.0082	.0045	.0028	.0010
POTASSIUM (g/m^2)	54	.0187	.0001	.0038	.0129	.0048	.0027	.0015	.0003
CALCIUM (g/m^2)	55	.132	.001	.0199	.0574	.0230	.0150	.0080	.0028
MAGNESIUM (g/m^2)	55	.0188	.0005	.0036	.0099	.0041	.0027	.0019	.0009
TOTAL PRECIPITATION (cm)	63	17.9	1.5	7.7238	14.6600	9.8000	6.9000	5.4000	2.8600
Station Number 230a				Station Name Whitman Creek, Ont.					
HYDROGEN ION (mg/m^2)	37	14.33	.15	4.1400	12.4400	5.1300	3.5100	2.6350	.4020
SULFATE (g/m^2)	37	.78	0	.2122	.6450	.2600	.1900	.1300	.0180
NITRATE (g/m^2)	36	.39	0	.1361	.2795	.1875	.1200	.0900	.0085
CHLORIDE (g/m^2)	35	.023	.002	.0103	.0222	.0140	.0100	.0060	.0020
AMMONIUM (g/m^2)	37	.109	.001	.0301	.0829	.0360	.0260	.0175	.0028
SODIUM (g/m^2)	36	.0109	.0002	.0040	.0101	.0051	.0036	.0019	.0005
POTASSIUM (g/m^2)	36	.0066	.0003	.0023	.0064	.0027	.0020	.0014	.0006
CALCIUM (g/m^2)	36	.053	0	.0143	.0453	.0187	.0120	.0070	.0008
MAGNESIUM (g/m^2)	36	.0074	.0001	.0023	.0058	.0029	.0022	.0013	.0003
TOTAL PRECIPITATION (cm)	49	20.8	.2	5.8429	12.7500	8.2000	5.1000	2.9500	.7500
Station Number 239a				Station Name Clearfield, N.Y.					
HYDROGEN ION (mg/m^2)	50	16.72	.95	5.2868	14.3350	6.3300	4.5850	2.3900	1.4010
SULFATE (g/m^2)	50	.91	.04	.2438	.6560	.3175	.1900	.1000	.0500
NITRATE (g/m^2)	50	.39	.03	.1344	.2545	.1850	.1100	.0800	.0300
CHLORIDE (g/m^2)	50	.045	.002	.0131	.0243	.0180	.0115	.0070	.0025
AMMONIUM (g/m^2)	50	.145	.005	.0292	.1041	.0400	.0195	.0117	.0061
SODIUM (g/m^2)	50	.0277	.0008	.0056	.0142	.0074	.0042	.0024	.0009
POTASSIUM (g/m^2)	50	.0218	0	.0031	.0124	.0034	.0019	.0010	.0004
CALCIUM (g/m^2)	50	.054	.002	.0148	.0457	.0200	.0115	.0050	.0035
MAGNESIUM (g/m^2)	50	.0079	.0002	.0020	.0056	.0024	.0017	.0008	.0004
TOTAL PRECIPITATION (cm)	50	21.7	1.6	9.2560	20.5900	12.5750	8.4500	4.9750	2.4200

Table 14.--Summary statistics for monthly ion-deposition data from precipitation-chemistry data-collection sites for which 3 or more years of data are available--Continued

Property or Constituent (Unit)	Summary Statistics				Percentage of Samples in Which Values Were Less than or Equal To Those Shown				
	Sample Size	Maxi- mum	Mini- mum	Mean	95	75	Median 50	25	5
Station Number		272a		Station Name	Purdue U Ag Farm, Ind.				
HYDROGEN ION (mg/m^2)	42	9.5	0.1	3.8048	9.2620	4.7525	3.0950	2.0850	0.4570
SULFATE (g/m^2)	42	.61	0	.2129	.5655	.2800	.1750	.1250	.0300
NITRATE (g/m^2)	42	.37	.01	.1198	.2825	.1500	.1100	.0700	.0130
CHLORIDE (g/m^2)	42	.254	.002	.0213	.0774	.0220	.0135	.0057	.0021
AMMONIUM (g/m^2)	42	.138	0	.0291	.0840	.0335	.0225	.0155	.0007
SODIUM (g/m^2)	42	.0149	.0011	.0061	.0144	.0089	.0052	.0032	.0013
POTASSIUM (g/m^2)	42	.0079	.0003	.0022	.0056	.0029	.0017	.0011	.0003
CALCIUM (g/m^2)	42	.057	.001	.0175	.0534	.0242	.0140	.0077	.0021
MAGNESIUM (g/m^2)	42	.0093	.0007	.0034	.0089	.0043	.0029	.0017	.0007
TOTAL PRECIPITATION (cm)	42	22.2	.5	7.3738	20.2350	10.0500	5.9000	4.0500	1.1750
Station Number		241a		Station Name	Gaylord, Mich.				
HYDROGEN ION (mg/m^2)	50	9.09	.32	2.3440	5.3745	3.1650	1.9650	1.4025	.5525
SULFATE (g/m^2)	50	.49	.01	.1176	.2780	.1625	.1050	.0475	.0200
NITRATE (g/m^2)	50	.31	.01	.0880	.1745	.1100	.0800	.0500	.0210
CHLORIDE (g/m^2)	50	.014	0	.0043	.0090	.0060	.0040	.0027	.0010
AMMONIUM (g/m^2)	50	.073	.003	.0200	.0592	.0262	.0175	.0080	.0040
SODIUM (g/m^2)	50	.005	0.0002	.0015	.0044	.0020	.0009	.0006	.0001
POTASSIUM (g/m^2)	50	.0034	.0001	.0011	.0028	.0016	.0008	.0004	.0002
CALCIUM (g/m^2)	50	.042	0	.0090	.0306	.0120	.0070	.0030	.0010
MAGNESIUM (g/m^2)	50	.0102	.0001	.0016	.0060	.0022	.0012	.0004	.0002
TOTAL PRECIPITATION (cm)	50	21.8	.8	6.1440	14.2150	7.3750	5.6000	3.5250	1.4750
Station Number		243a		Station Name	Big Moose, N.Y.				
HYDROGEN ION (mg/m^2)	51	14.44	.85	5.5222	13.2640	6.7300	5.0100	3.5400	1.7320
SULFATE (g/m^2)	51	.71	.02	.2375	.6380	.3200	.1900	.1300	.0500
NITRATE (g/m^2)	51	.34	.02	.1794	.3140	.2400	.1800	.1100	.0720
CHLORIDE (g/m^2)	51	.027	.001	.0126	.0234	.0170	.0110	.0080	.0046
AMMONIUM (g/m^2)	51	.074	.001	.0306	.0650	.0420	.0250	.0200	.0052
SODIUM (g/m^2)	51	.0172	0.0009	.0054	.0143	.0075	.0041	.0026	.0009
POTASSIUM (g/m^2)	51	.0287	.0001	.0054	.0172	.0071	.0036	.0016	.0006
CALCIUM (g/m^2)	51	.044	0	.0127	.0318	.0160	.0110	.0080	.0030
MAGNESIUM (g/m^2)	51	.0103	.0003	.0025	.0066	.0029	.0021	.0014	.0005
TOTAL PRECIPITATION (cm)	51	28.7	4.1	10.8235	22.0600	13.3000	10.2000	6.8000	4.8800

Table 15.--Results of Seasonal Kendall test for trends in pH and precipitation-adjusted regression residuals

Station number	Station name	Number of observations	Statistics for pH (statistics for residuals) Tau	P level	Slope[1]
025a	Indiana Dunes, Ind.	66	0.219	0.112	0.0230
032a	Kellogg, Mich.	78	-.093	.458	-.0095
033a	Wellston, Mich.	78	.105	.397	.0100
040a	Aurora, N.Y.	81	-.025	.871	-.0009
041a	Chautauqua, N.Y.	67	.095	.515	.0100
042a	Knobit, N.Y.	59	.176	.251	.0225
			(176	.255	1.89)
043a	Whiteface, N.Y.	108	.138	.147	.0112
044a	Ithaca, N.Y.	104	.353	.000	.0215
			(.324	.001	2.10)
045a	Stillwell Lake, N.Y.	63	.400	.004	.0400
			(.242	.090	2.50)
046a	Bennett Bridge, N.Y.	64	.050	.765	.0029
			(-.100	.502	-.96)
047a	Jasper, N.Y.	65	.137	.340	.0112
048a	Brookhaven, N.Y.	90	.010	.964	.0012
			(-.019	.891	-.22)
055a	Delaware, Ohio	87	.122	.277	.0100
056a	Caldwell, Ohio	88	-.032	.806	-.0025
057a	Oxford, Ohio	85	.200	.079	.0125
			(.189	.099	1.18)
058a	Wooster, Ohio	88	.106	.351	.0070
			(.122	.282	.88)
063a	Kane, Pa.	75	.227	.059	.0179
064a	Leading Ridge, Pa.	81	-.012	.957	-.0006
065a	Penn State, Pa.	107	.190	.047	.0114
075a	Parsons, W. Va.	90	.094	.400	.0050
143b	Longwoods, Ont.	58	.314	.034	.0300
151a	Scranton, Pa.	75	.366	.002	.0220
			(.324	.007	2.68)
153a	Zanesville, Ohio	84	.343	.002	.0162
154a	Rockport, Ind.	84	.183	.108	.0170
			(.177	.122	.02)
156a	Fort Wayne, Ind.	83	.172	.139	.0200
168a	Huntington, N.Y.	82	.101	.395	.0090
			(.012	.958	.03)
176a	Colchester, Ont.	56	.295	.036	.0400
177a	Merlin, Ont.	55	.148	.342	.0300
178a	Port Stanley, Ont.	48	.133	.424	.0217
179a	Wilkesport, Ont.	53	.091	.600	.0050
180a	Alvinston, Ont.	56	-.037	.866	-.0050
181a	Shallow Lake, Ont.	54	.079	.660	.0087
			(-.053	.792	.64)
182a	Palmerston, Ont.	49	.121	.497	.0081
184a	Waterloo, Ont.	48	.145	.420	.0125
187a	Uxbridge, Ont.	44	-.083	.687	-.0072
189a	Campbellford, Ont.	53	.103	.514	.0200
			(.103	.517	.87)
192a	Smiths Falls, Ont.	49	.038	.864	.0167
221a	Melbourne, Ont.	55	.257	.105	.0355
			(.243	.127	1.89)
222a	North Easthope, Ont.	55	.342	.029	.0575
			(.237	.137	4.70)
225a	Balsam Lake, Ont.	53	.318	.052	.0412
228a	Railton, Ont.	55	.308	.051	.0425
			(.359	.022	4.77)
229a	Graham Lake, Ont.	55	-.135	.415	-.0269

[1]Slope of pH is in standard units per year; slope of residuals is in percent of change per year.

Table 16.--Results of Seasonal Kendall test for trends in sulfate concentrations and precipitation-adjusted regression residuals

Station number	Station name	Number of observations	Statistics for concentration (statistics for residuals) Tau	P level	Slope[1]
025a	Indiana Dunes, Ind.	66	-0.295	0.030	-0.2050
			(-.314	.021	-7.44)
032a	Kellogg, Mich.	78	-.347	.004	-.1531
			(-.293	.014	-4.67)
033a	Wellston, Mich.	78	-.322	.007	-.2150
			(-.250	.037	-5.81)
040a	Aurora, N.Y.	81	-.210	.073	-.0975
041a	Chautauqua, N.Y.	67	-.143	.312	-.1025
			(-.086	.563	-2.32)
042a	Knobit, N.Y.	59	-.247	.104	-.1133
			(-.224	.143	4.27)
043a	Whiteface, N.Y.	111	-.111	.239	-.0400
			(.010	.945	-.06)
044a	Ithaca, N.Y.	110	-.195	.038	-.0500
			(.088)		
045a	Stilwell Lake, N.Y.	63	-.474	.001	-.1600
			(-.368	.009	-8.81)
046a	Bennett Bridge, N.Y.	64	-.290	.036	-.2333
			(-.320	.021	-6.23)
047a	Jasper, N.Y.	65	-.255	.068	-.1125
			(-.196	.165	-3.75)
048a	Brookhaven, N.Y.	94	-.071	.512	-.0312
			(-.045	.694	-0.62)
055a	Delaware, Ohio	87	-.317	.004	-.0925
056a	Caldwell, Ohio	88	-.291	.008	-.1208
057a	Oxford, Ohio	88	-.429	.000	-.1225
058a	Wooster, Ohio	88	-.259	.019	-.1250
063a	Kane, Pa.	75	-.208	.086	-.1300
064a	Leading Ridge, Pa.	81	-.259	.026	-.0987
065a	Penn State, Pa.	112	.016	.890	.0063
075a	Parsons, W. Va.	90	-.379	.000	-.1575
143b	Longwoods, Ont.	58	-.081	.628	-.0450
			(-.047	.809	-.87)
151a	Scranton, Pa.	75	-.152	.221	-.0366
153a	Zanesville, Ohio	84	-.246	.030	-.0685
154a	Rockport, Ind.	84	.086	.470	.0366
156a	Fort Wayne, Ind.	83	-.124	.292	-.0500
			(-.148	.206	-2.22)
168a	Huntington, N.Y.	82	-.250	.029	-.0883
176a	Colchester, Ont.	59	-.526	.000	-.4250
			(-.411	.003	-11.7)
177a	Merlin, Ont.	59	-.253	.082	-.1563
178a	Port Stanley, Ont.	56	-.314	.032	-.2231
179a	Wilkesport, Ont.	60	-.368	.009	-.4188
180a	Alvinston, Ont.	57	-.311	.031	-.2500
			(-.422	.003	-6.78)
181a	Shallow Lake, Ont.	55	-.244	.116	-.1417
182a	Palmerston, Ont.	57	-.420	.005	-.2400
184a	Waterloo, Ont.	52	-.043	.852	-.0250
187a	Uxbridge, Ont.	50	-.209	.215	-.1750
189a	Campbellford, Ont.	57	-.034	.871	-.0312
192a	Smiths Falls, Ont.	59	-.233	.119	-.1750
221a	Melborne, Ont.	54	-.352	.028	-.1767
222a	North Easthope, Ont.	55	-.132	.431	-.2163
			(-.105	.540	-5.55)
225a	Balsam Lake, Ont.	53	.152	.385	.0750
228a	Railton, Ont.	55	-.038	.865	-.0325
229a	Graham Lake, Ont.	55	.149	.367	.1063
			(.135	.419	2.59)

[1]Slope of concentrations is in milligrams per liter of change per year; slope of residuals is in percentage of change per year.

Table 17.--Results of Seasonal Kendall test for trends in nitrate concentrations and precipitation-adjusted regression residuals

Station number	Station name	Number of observations	Statistics for concentration (statistics for residuals) Tau	P level	Slope[1]
025a	Indiana Dunes, Ind.	66	-.162	.248	-.0850
			(-.238	.083	-3.241)
032a	Kellogg, Mich.	78	-.093	.458	-.0427
			(-.107	.392	-1.91)
033a	Wellston, Mich.	78	-.289	.016	-.1070
			(.079	.536	5.63)
040a	Aurora, N.Y.	81	.025	.871	.0137
			(-.086	.480	-4.20)
041a	Chautauqua, N.Y.	67	.010	1.000	.0200
			(.067	.665	1.16)
042a	Knobit, N.Y.	59	-.118	.462	-.0487
			(-.012	1.000	-1.12)
043a	Whiteface, N.Y.	111	-.073	.446	-.0267
			(.010	.945	.06)
044a	Ithaca, N.Y.	110	-.046	.647	-.0175
			(.088	.360	2.57)
045a	Stilwell Lake, N.Y.	63	-.274	.053	-.1100
			(-.221	.123	-10.7)
046a	Bennett Bridge, N.Y.	64	-.140	.333	-.0950
			(-.040	.823	-1.03)
047a	Jasper, N.Y.	65	-.225	.107	-.0805
			(-.196	.165	-3.6)
048a	Brookhaven, N.Y.	94	.045	.694	.0142
			(.152	.149	3.79)
055a	Delaware, Ohio	87	.016	.922	.0020
			(-.016	.922	.16)
056a	Caldwell, Ohio	88	-.286	.009	-.0475
			(-.270	.014	-3.42)
057a	Oxford, Ohio	88	-.201	.069	-.0429
			(-.090	.434	-1.91)
058a	Wooster, Ohio	88	-.143	.203	-.0400
			(-.005	1.000	-.22)
063a	Kane, Pa.	75	-.156	.202	-.0642
			(-.065	.618	-3.69)
064a	Leading Ridge, Pa.	81	.080	.514	.0271
			(-.037	.786	-.18)
065a	Penn State, Pa.	112	.022	.836	.0066
			(-.016	.890	-.19)
075a	Parsons, W. Va.	90	-.123	.262	-.0450
			(-.281	.009	-5.56)
143b	Longwoods, Ont.	58	-.000	1.000	-.0006
			(.233	.126	2.22)
151a	Scranton, Pa.	75	.110	.381	.0240
			(.021	.907	1.42)
153a	Zanesville, Ohio	84	.029	.837	.0200
			(-.074	.536	-.98)
154a	Rockport, Ind.	84	.006	1.000	.0017
			(-.074	.536	-.60)
156a	Fort Wayne, Ind.	83	-.195	.091	-.0567
			(-.065	.598	-1.13)
168a	Huntington, N.Y.	82	.006	1.000	.0008
			(.071	.559	1.89)
176a	Colchester, Ont.	57	-.302	.040	-.2962
			(-.209	.163	-4.51)
177a	Merlin, Ont.	60	-.158	.281	-.1850
			(-.200	.165	-3.97)
178a	Port Stanley, Ont.	55	-.146	.350	-.0344
			(-.098	.555	-4.70)
179a	Wilkesport, Ont.	58	-.022	.937	-.0300
			(-.099	.528	-2.59)
180a	Alvinston, Ont.	57	-.233	.119	-.0850
			(-.163	.286	-4.61)
181a	Shallow Lake, Ont.	56	-.154	.338	-.0858
			(.103	.542	4.74)
182a	Palmerston, Ont.	59	-.035	.869	-.0225
			(-.116	.460	-1.627)
184a	Waterloo, Ont.	52	-.070	.714	-.0400
187a	Uxbridge, Ont.	51	-.114	.516	-.0675
189a	Campbellford, Ont.	58	-.022	.937	-.0050
			(.077	.636	1.572)
192a	Smiths Falls, Ont.	60	.056	.747	.0160
			(-.156	.299	-5.30)
221a	Melbourne, Ont.	54	.099	.582	.0250
			(.183	.271	5.90)
222a	North Easthope, Ont.	55	-.132	.431	-.0865
			(.105	.540	2.10)
225a	Balsam Lake, Ont.	53	.333	.043	.0771
			(.364	.026	6.78)
228a	Railton, Ont.	56	-.012	1.000	-.0040
			(-.210	.182	-4.40)
229a	Graham Lake, Ont.	55	.216	.178	.1525
			(.054	.788	5.71)

[1]Slope of concentrations is in milligrams per liter of change per year; slope of residuals is in percentage of change per year.

Table 18.--Results of Seasonal Kendall test for trends in chloride concentrations and precipitation-adjusted regression residuals

Station number	Station name	Number of observations	Statistics for concentration (statistics for residuals) Tau	P level	Slope[1]
025a	Indiana Dunes, Ind.	66	-0.181	0.189	-0.0125
			(-.219	.112	-5.54)
032a	Kellogg, Mich.	78	-.027	.862	-.0000
			(.053	.689	1.12)
033a	Wellston, Mich.	78	-.520	.000	-.0245
			(-.289	.016	8.10)
040a	Aurora, N.Y.	81	-.117	.321	-.0045
			(-.111	.356	-2.98)
041a	Chautauqua, N.Y.	67	-.010	1.000	-.0000
			(.143	.312	2.06)
042a	Knobit, N.Y.	59	-.200	.190	-.0100
			(-.153	.329	-7.29)
043a	Whiteface, N.Y.	111	-.035	.728	-.0014
044a	Ithaca, N.Y.	110	-.140	.138	-.0050
045a	Stilwell Lake, N.Y.	63	-.242	.088	-.0337
046a	Bennett Bridge, N.Y.	64	-.060	.708	-.0050
			(.020	.941	.75)
047a	Jasper, N.Y.	65	-.333	.015	-.0137
048a	Brookhaven, N.Y.	94	-.138	.189	-.0309
055a	Delaware, Ohio	87	-.101	.376	-.0050
			(-.079	.493	-2.40)
056a	Caldwell, Ohio	88	-.058	.624	-.0038
			(-.021	.883	-0.99)
057a	Oxford, Ohio	88	-.180	.105	-.0100
			(-.122	.282	-2.49)
058a	Wooster, Ohio	88	-.222	.043	-.0083
063a	Kane, Pa.	75	-.260	.030	-.0100
			(-.208	.086	-4.50)
064a	Leading Ridge, Pa.	81	-.296	.009	-.0075
065a	Penn State, Pa.	112	.041	.677	.0020
			(.003	1.000	.24)
075a	Parson, W. Va.	90	-.236	.027	-.0067
			(-.310	.004	-4.66)
143b	Longwoods, Ont.	58	-.058	.745	-.0006
			(.000	1.000	-.15)
151a	Scranton, Pa.	75	-.055	.682	-.0033
153a	Zanesville, Ohio	84	-.223	.048	-.0080
154a	Rockport, Ind.	84	.223	.049	.0100
156a	Fort Wayne, Ind.	83	-.231	.044	-.0067
168a	Huntington, N.Y.	82	-.131	.261	-.0042
			(-.036	.791	-1.36)
176a	Colchester, Ont.	57	-.267	.070	-.221
177a	Merkin, Ont.	58	-.316	.025	-.0250
178a	Port Stanley, Ont.	56	-.244	.098	-.0141
			(.070	.682	1.84)
179a	Wilkesport, Ont.	56	-.165	.269	-.0266
180a	Alvinston, Ont.	57	-.233	.117	-.0275
181a	Shallow Lake, Ont.	54	-.128	.426	-.0075
182a	Palmerston, Ont.	58	-.151	.320	-.0116
			(-.140	.367	-5.08)
184a	Waterloo, Ont.	52	-.197	.227	-.0050
187a	Uxbridge, Ont.	50	-.324	.049	-.0200
189a	Campbellford, Ont.	56	-.034	.870	-.0000
			(.080	.627	3.15)
192a	Smiths Falls, Ont.	56	-.163	.283	-.0133
221a	Melbourne, Ont.	54	-.296	.064	-.0150
222a	North Easthope, Ont.	55	-.263	.096	-.0141
225a	Balsam Lake, Ont.	53	-.197	.240	-.0100
			(.0	1.000	.84)
228a	Railton, Ont.	56	-.296	.052	-.0133
229a	Graham Lake, Ont.	55	-.203	.199	-.0138

[1]Slope of concentrations is in milligrams per liter of change per year; slope of residuals is in percentage of change per year.

Table 19.--Results of Seasonal Kendall test for trends in ammonium concentrations and precipitation-adjusted regression residuals

Station number	Station name	Number of observations	Statistics for concentration (statistics for residuals) Tau	P level	Slope[1]
025a	Indiana Dunes, Ind.	66	-0.295	0.030	-0.0250
			(-.276	.043	-7.62)
032a	Kellogg, Mich.	78	-.133	.275	-.0187
			-.147	.230	-4.08)
033a	Wellston, Mich.	78	-.171	.158	-.0175
			-.053	.694	-1.32)
040a	Aurora, N.Y.	81	-.012	.957	-.0012
041a	Chautauqua, N.Y.	67	-.048	.771	-.6667
			(-.048	.773	-1.32)
042a	Knobit, N.Y.	59	-.094	.568	-.0100
043a	Whiteface, N.Y.	111	-.054	.578	-.0020
044a	Ithaca, N.Y.	110	.062	.526	.0033
045a	Stilwell Lake, N.Y.	63	-.084	.583	-.0025
			(-.053	.758	-1.85)
046a	Bennett Bridge, N.Y.	64	-.210	.135	-.0200
			(-.140	.333	-3.23)
047a	Jasper, N.Y.	65	-.186	.187	-.0145
048a	Brookhaven, N.Y.	94	-.054	.629	-.0035
055a	Delaware, Ohio	87	.206	.063	.0175
056a	Caldwell, Ohio	88	-.053	.659	-.0025
057a	Oxford, Ohio	88	-.238	.031	-.0175
058a	Wooster, Ohio	88	.069	.556	.0033
063a	Kane, Pa.	75	.065	.617	.0060
064a	Leading Ridge, Pa.	81	.037	.785	.0042
065a	Penn State, Pa.	112	.019	.862	.0000
075a	Parsons, W. Va.	90	-.172	.110	-.0100
143b	Longwoods, Ont.	58	.0	1.000	.0000
			(.047	.809	1.19)
151a	Scranton, Pa.	75	.083	.520	.0040
153a	Zanesville, Ohio	84	-.034	.796	-.0017
154a	Rockport, Ind.	84	.109	.350	.0092
			(.143	.216	2.91)
156a	Fort Wayne, Ind.	83	-.231	.043	-.0100
			(-.136	.246	-1.67)
168a	Huntington, N.Y.	82	.048	.709	.0037
176a	Colchester, Ont.	58	-.264	.068	-.0767
			(-.385	.007	-11.12)
177a	Merlin, Ont.	59	-.263	.064	-.0700
			(-.411	.003	-12.64)
178a	Port Stanley, Ont.	52	-.162	.323	-.0312
			(-.162	.323	-4.07)
179a	Wilkesport, Ont.	54	-.293	.051	-.0635
			(-.366	.014	-17.84)
180a	Alvinston, Ont.	57	-.267	.070	-.0437
			(-.326	.027	-7.76)
181a	Shallow Lake, Ont.	55	-.192	.221	-.0340
			(-.077	.663	-2.20)
182a	Palmerston, Ont.	58	-.233	.119	-.0656
			(-.395	.007	-9.67)
184a	Waterloo, Ont.	47	-.153	.410	-.0267
187a	Uxbridge, Ont.	50	-.314	.051	-.0512
			(-.371	.020	-11.85)
189a	Campbellford, Ont.	55	.034	.871	.0067
192a	Smiths Falls, Ont.	59	-.267	.066	-.0350
			(-.267	.066	-5.97)
221a	Melbourne, Ont.	54	-.141	.407	-.0150
222a	North Easthope, Ont.	55	-.039	.861	-.0812
225a	Balsam Lake, Ont.	53	.136	.428	.0090
228a	Railton, Ont.	55	.0	1.000	.0000
229a	Graham Lake, Ont.	55	.068	.718	.0075

[1]Slope of concentrations is in milligrams per liter of change per year; slope of residuals is in percentage of change per year.

Table 20.--Results of Seasonal Kendall test for trends in sodium concentrations and precipitation-adjusted regression residuals

Station number	Station name	Number of observations	Statistics for concentration (statistics for residuals)		
			Tau	P level	Slope[1]
025a	Indiana Dunes, Ind.	66	-0.095	0.515	-0.0035
			(-.181	.194	-4.43)
032a	Kellogg, Mich.	78	-.280	.019	-.0103
			(-.187	.123	-10.61)
033a	Wellston, Mich.	78	-.434	.000	-.0138
			(-.250	.037	-14.17)
040a	Aurora, N.Y.	81	-.228	.050	-.0097
			(-.259	.026	-11.82)
041a	Chautauqua, N.Y.	67	-.029	.885	.0002
			(-.181	.194	6.79)
042a	Knobit, N.Y.	59	-.188	.221	-.0105
			(-.176	.255	-10.85
043a	Whiteface, N.Y.	106	-.045	.662	-.0005
			(-.017	.884	-.55)
044a	Ithaca, N.Y.	106	-.062	.535	-.0005
			(-.024	.827	-.66)
045a	Stilwell Lake, N.Y.	63	-.347	.014	-.0330
046a	Bennett Bridge, N.Y.	64	.060	.709	.0009
047a	Jasper, N.Y.	65	-.176	.214	-.0068
			(-.216	.125	-6.34)
048a	Brookhaven, N.Y.	94	-.098	.358	-.0173
055a	Delaware, Ohio	87	-.386	.000	-.0160
056a	Caldwell, Ohio	88	-.354	.001	-.0120
057a	Oxford, Ohio	88	-.228	.040	-.0054
058a	Wooster, Ohio	88	-.418	.000	-.0160
			(-.418	.000	-18.40)
063a	Kane, Pa.	75	-.357	.003	-.0090
064a	Leading Ridge, Pa.	81	-.543	.000	-.0207
			(-.531	.000	-18.95)
065a	Penn State, Pa.	107	.034	.742	.0001
			(.065	.512	3.18)
075a	Parsons, W. Va.	90	-.537	.000	-.0137
143b	Longwoods, Ont.	58	-.035	.872	-.0017
151a	Scranton, Pa.	75	-.338	.005	-.0087
153a	Zanesville, Ohio	84	-.337	.003	-.0122
154a	Rockport, Ind.	84	-.114	.325	-.0040
			(-.136	.246	-4.72)
156a	Fort Wayne, Ind.	83	-.290	.011	-.0825
168a	Huntington, N.Y.	82	-.375	.001	-.0134
			(-.440	.000	-14.33)
176a	Colchester, Ont.	53	-.024	.933	-.0000
			(.133	.404	7.75)
177a	Merlin, Ont.	55	.110	.476	.0025
178a	Port Stanley, Ont.	51	-.066	.721	-.0009
			(.105	.538	7.19)
179a	Wilkesport, Ont.	52	-.024	.934	-.0034
			(.024	.934	1.70)
180a	Alvinston, Ont.	55	-.123	.444	-.0037
			(-.111	.501	-4.24)
181a	Shallow Lake, Ont.	54	-.108	.530	-.0018
182a	Palmerston, Ont.	57	-.284	.056	-.0050
			(-.086	.608	-2.85)
184a	Waterloo, Ont.	52	-.121	.495	-.0037
			(-.061	.772	3.01)
187a	Uxbridge, Ont.	47	-.123	.490	-.0025
189a	Campbellford, Ont.	56	-.023	.935	-.0010
			(-.080	.627	-5.10)
192a	Smiths Falls, Ont.	55	-.217	.155	-.0087
221a	Melbourne, Ont.	54	-.324	.044	-.0112
222a	North Easthope, Ont.	54	-.169	.311	-.0283
225a	Balsam Lake, Ont.	53	.258	.121	.0064
228a	Railton, Ont.	55	-.179	.270	-.0064
229a	Graham Lake, Ont.	55	-.243	.127	-.0060

[1]Slope of concentrations is in milligrams per liter of change per year; slope of residuals is in percentage of change per year.

Table 21.--Results of Seasonal Kendall test for trends in potassium concentrations and precipitation-adjusted regression residuals

Station number	Station name	Number of observations	Statistics for concentration (statistics for residuals) Tau	P level	Slope[1]
025a	Indiana Dunes, Ind.	66	-0.057	0.717	-0.0008
			(-.162	.248	-5.88)
032a	Kellogg, Mich.	78	-.187	.119	-.0010
			(-.133	.278	-2.45)
033a	Wellston, Mich.	78	-.191	.112	-.0013
			(-.132	.285	-2.77)
040a	Aurora, N.Y.	81	-.272	.019	-.0020
041a	Chautauqua, N.Y.	67	.143	.312	.0030
			(.257	.060	12.23)
042a	Knobit, N.Y.	59	-.176	.251	-.0010
			(-.035	.871	-2.62)
043a	Whiteface, N.Y.	105	-.244	.011	-.0025
044a	Ithaca, N.Y.	106	-.282	.003	-.0022
045a	Stilwell Lake, N.Y.	63	-.189	.186	-.0020
			(-.158	.281	-5.84)
046a	Bennett Bridge, N.Y.	64	-.050	.765	-.0006
			(.080	.602	2.51)
047a	Jasper, N.Y.	65	-.216	.123	-.0017
048a	Brookhaven, N.Y.	94	-.344	.001	-.0071
			(-.393	.000	-15.83)
055a	Delaware, Ohio	87	.116	.302	.0005
			(.101	.378	.0291)
056a	Caldwell, Ohio	88	-.190	.086	-.0011
057a	Oxford, Ohio	88	-.471	.000	-.0057
058a	Wooster, Ohio	88	-.339	.002	-.0020
063a	Kane, Pa.	75	-.260	.030	-.0012
			(-.208	.086	-3.86)
064a	Leading Ridge, Pa.	81	-.019	.913	-.0000
			(-.086	.480	-2.15)
065a	Penn State, Pa.	107	-.137	.155	-.0020
075a	Parson, W. Va.	90	-.281	.009	-.0020
			(-.300	.005	-6.06)
143b	Longwoods, Ont.	58	.186	.227	.0044
			(.209	.171	10.23)
151a	Scranton, Pa.	69	-.306	.017	-.0025
153a	Zanesville, Ohio	69	-.471	.000	-.0052
154a	Rockport, Ind.	69	.074	.595	.0006
156a	Fort Wayne, Ind.	68	-.526	.000	-.0048
			(-.500	.000	-14.02)
168a	Huntington, N.Y.	82	.089	.455	.0004
			(.143	.222	4.21)
176a	Colchester, Ont.	53	-.128	.407	-.0038
			(-.140	.367	-6.61)
177a	Merlin, Ont.	57	-.286	.048	-.0075
178a	Port Stanley, Ont.	50	-.070	.708	-.0000
			(.042	.854	.29)
179a	Wilkesport, Ont.	53	-.119	.455	-.0055
180a	Alvinston, Ont.	55	-.235	.127	-.0150
181a	Shallow Lake, Ont.	52	-.338	.029	-.0050
182a	Palmerston, Ont.	55	-.293	.049	-.0050
184a	Waterloo, Ont.	51	-.232	.155	-.0075
187a	Uxbridge, Ont.	46	-.062	.770	-.0020
189a	Campbellford, Ont.	51	-.087	.610	-.0035
192a	Smiths Falls, Ont.	52	-.392	.011	-.0063
221a	Melbourne, Ont.	54	-.042	.855	-.0013
			(-.042	.855	-1.19)
222a	North Easthope, Ont.	54	-.239	.142	-.0041
			(-.239	.142	-5.30)
225a	Balsam Lake, Ont.	53	.197	.245	.0030
			(.182	.288	14.87)
228a	Railton, Ont.	54	-.311	.053	-.0036
229a	Graham Lake, Ont.	54	-.246	.131	-.0047

[1]Slope of concentrations is in milligrams per liter of change per year; slope of residuals is in percentage of change per year.

Table 22.--Results of Seasonal Kendall test for trends in calcium concentrations and precipitation-adjusted regression residuals

Station number	Station name	Number of observations	Statistics for concentration (statistics for residuals) Tau	P level	Slope[1]
025a	Indiana Dunes, Ind.	66	-0.210	0.128	-0.0300
			(-.200	.149	-10.98)
032a	Kellogg, Mich.	78	-.153	.203	-.0168
			(-.187	.123	-6.55)
033a	Wellston, Mich.	78	-.395	.001	-.0300
			(-.303	.011	-7.28)
040a	Aurora, N.Y.	81	-.167	.155	-.0067
			(-.173	.142	-4.19)
041a	Chautauqua, N.Y.	67	-.019	.942	-.0025
			(-.048	.773	-2.33)
042a	Knobit, N.Y.	59	-.224	.140	-.0183
			(-.224	.143	-6.57)
043a	Whiteface, N.Y.	101	-.215	.029	-.0039
044a	Ithaca, N.Y.	101	-.109	.277	-.0033
			(-.078	.449	-1.14)
045a	Stilwell Lake, N.Y.	63	-.126	.386	-.0067
			(-.284	.045	-8.87)
046a	Bennett Bridge, N.Y.	64	-.300	.030	-.0200
			(-.240	.086	-7.94)
047a	Jasper, N.Y.	65	-.363	.008	-.0150
			(-.392	.004	-12.27)
048a	Brookhaven, N.Y.	94	-.246	.017	-.0067
			(-.232	.026	-5.75)
055a	Delaware, Ohio	87	-.101	.373	-.0050
			(-.101	.378	-.85)
056a	Caldwell, Ohio	88	-.201	.070	-.0133
			(-.280	.011	-6.45)
057a	Oxford, Ohio	88	-.280	.010	-.0150
058a	Wooster, Ohio	88	-.317	.004	-.0175
			(-.333	.002	-9.14)
063a	Kane, Pa.	75	-.123	.315	-.0417
			(-.195	.108	-4.18)
064a	Leading Ridge, Pa.	81	-.216	.062	-.0100
			(-.296	.011	-6.20)
065a	Penn State, Pa.	101	-.148	.138	-.0033
			(-.164	.102	-4.07)
075a	Parsons, W. Va.	90	-.379	.000	-.0150
			(-.389	.000	-6.95)
143b	Longwoods, Ont.	58	-.012	1.000	-.0013
			(.070	.687	1.33)
151a	Scranton, Pa.	75	-.276	.022	-.0075
153a	Zanesville, Ohio	84	-.274	.015	-.0150
			(-.360	.001	-8.17)
154a	Rockport, Ind.	84	-.029	.832	-.0000
			(-.006	1.000	-.13)
156a	Fort Wayne, Ind.	83	-.172	.140	-.0175
			(-.243	.035	-7.15)
168a	Huntington, N.Y.	82	-.030	.831	-.0017
			(-.036	.791	-.38)
176a	Colchester, Ont.	54	-.215	.170	-.0400
			(-.114	.492	-6.17)
177a	Merlin, Ont.	52	-.169	.291	-.0250
			(-.143	.379	-6.19)
178a	Port Stanley, Ont.	45	-.141	.434	-.0133
			(.063	.770	4.49)
179a	Wilkesport, Ont.	48	-.277	.102	-.0813
			(-.385	.022	-15.09)
180a	Alvinston, Ont.	50	-.183	.271	-.0200
			(-.211	.199	-9.46)
181a	Shallow Lake, Ont.	54	-.122	.471	-.0100
082a	Palmerston, Ont.	51	-.299	.070	-.0500
			(-.284	.088	-1.10)
184a	Waterloo, Ont.	50	-.113	.545	-.0142
187a	Uxbridge, Ont.	38	-.073	.800	-.0300
189a	Campbellford, Ont.	50	-.085	.646	-.0067
			(.070	.715	1.81)
192a	Smiths Falls, Ont.	49	-.362	.024	-.0700
221a	Melbourne, Ont.	54	.070	.714	.0117
			(.042	.855	6.75)
222a	North Easthope, Ont.	54	.113	.515	.0150
			(.127	.463	3.97)
225a	Balsam Lake, Ont.	53	.364	.025	-.0275
			(.545	.001	-22.72)
228a	Railton, Ont.	55	.038	.865	.0037
			(.0	1.000	.04)
229a	Graham Lake, Ont.	55	.135	.415	.0200

[1] Slope of concentrations is in milligrams per liter of change per year; slope of residuals is in percentage of change per year.

Table 23.--Results of Seasonal Kendall test for trends in magnesium concentrations and precipitation-adjusted regression residuals

Station number	Station name	Number of observations	Statistics for concentration (statistics for residuals) Tau	P level	Slope[1]
025a	Indiana Dunes, Ind.	66	-0.219	0.110	-0.0072
			(-.257	.060	-12.54)
032a	Kellogg, Mich.	78	-.053	.687	-.0003
			(-.040	.775	-.80)
033a	Wellston, Mich.	78	-.349	.003	-.0052
			(-.171	.160	-4.92)
040a	Aurora, N.Y.	81	-.049	.703	-.0008
			(-.012	.957	-.63)
041a	Chautauqua, N.Y.	67	-.133	.344	-.0020
			(.067	.665	2.09)
042a	Knobit, N.Y.	59	-.165	.285	-.0026
			(-.106	.515	-3.30)
043a	Whiteface, N.Y.	100	-.234	.019	-.0007
044a	Ithaca, N.Y.	100	-.210	.037	-.0009
			(-.266	.008	-3.14)
045a	Stilwell Lake, N.Y.	63	-.200	.165	-.0032
			(-.221	.123	-4.61)
046a	Bennett Bridge, N.Y.	64	-.250	.073	-.0024
			(-.140	.333	-5.40)
047a	Jasper, N.Y.	65	-.108	.461	-.0012
			(-.039	.827	-1.03)
048a	Brookhaven, N.Y.	94	-.179	.087	-.0040
055a	Delaware, Ohio	87	.026	.845	.0003
			(-.016	.922	-.28)
056a	Caldwell, Ohio	88	-.021	.883	-.0001
			(-.090	.434	-1.49)
057a	Oxford, Ohio	88	-.323	.003	-.0024
058a	Wooster, Ohio	88	-.085	.462	-.0010
			(-.069	.557	-1.37)
063a	Kane, Pa.	75	-.156	.199	-.0006
			(-.169	.166	-1.88)
064a	Leading Ridge, Pa.	81	-.198	.090	-.0020
			(-.185	.115	-4.49)
065a	Penn State, Pa.	100	-.040	.713	-.0002
			(-.024	.839	-.70)
075a	Parsons, W. Va.	90	-.103	.348	-.0005
			(-.034	.780	-.84)
143b	Longwoods, Ont.	58	.070	.685	.0017
			(.140	.375	3.50)
151a	Scranton, Pa.	75	-.172	.161	-.0007
153a	Zanesville, Ohio	84	-.269	.017	-.0018
			(-.394	.000	-9.98)
154a	Rockport, Ind.	84	.131	.252	.0010
156a	Fort Wayne, Ind.	83	-.107	.369	-.0017
			(-.207	.073	-5.57)
168a	Huntington, N.Y.	82	.065	.594	.0003
			(.131	.265	2.88)
176a	Colchester, Ont.	54	-.286	.058	-.0156
			(-.333	.026	-14.41)
177a	Merlin, Ont.	52	-.177	.263	-.0100
			(-.165	.303	-7.93)
178a	Port Stanley, Ont.	49	-.194	.229	-.0046
			(-.165	.303	-7.93)
179a	Wilkesport, Ont.	52	-.427	.005	-.0162
			(-.512	.001	-13.28)
180a	Alvinston, Ont.	53	-.190	.226	-.0075
			(-.215	.170	-10.22)
181a	Shallow Lake, Ont.	54	-.257	.101	-.0050
182a	Palmerston, Ont.	54	-.370	.017	-.0150
			(-.315	.046	-16.85)
184a	Waterloo, Ont.	51	-.242	.148	-.0050
187a	Uxbridge, Ont.	46	-.121	.534	-.0046
189a	Campbellford, Ont.	56	.080	.625	.0017
			(.126	.418	4.44)
192a	Smiths Falls, Ont.	35	-.162	.496	-.0017
221a	Melbourne, Ont.	54	.070	.714	.0025
			(.183	.271	6.11)
222a	North Easthope, Ont.	54	.254	.118	.0035
			(.268	.099	6.33)
225a	Balsam Lake, Ont.	53	.258	.121	.0014
			(.273	.101	11.59)
228a	Railton, Ont.	55	.0	1.000	.0000
			(-.077	.671	-1.70)
229a	Graham Lake, Ont.	55	-.027	.928	-.0006
			(-.054	.788	-6.37)

[1]Slope of concentrations is in milligrams per liter of change per year; slope of residuals is in percentage of change per year.

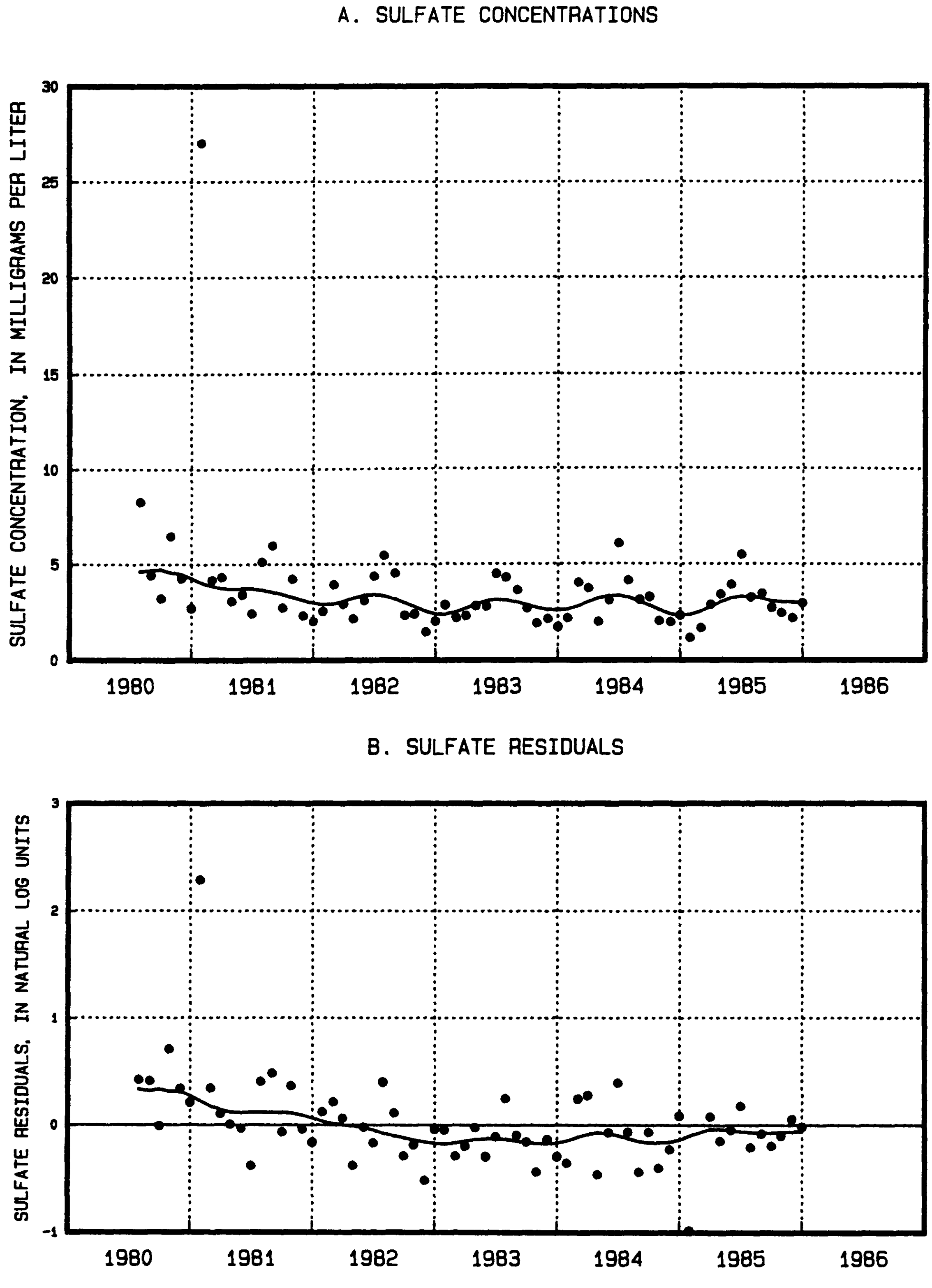


Figure 29.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, Indiana Dunes, Indiana, site 025a.

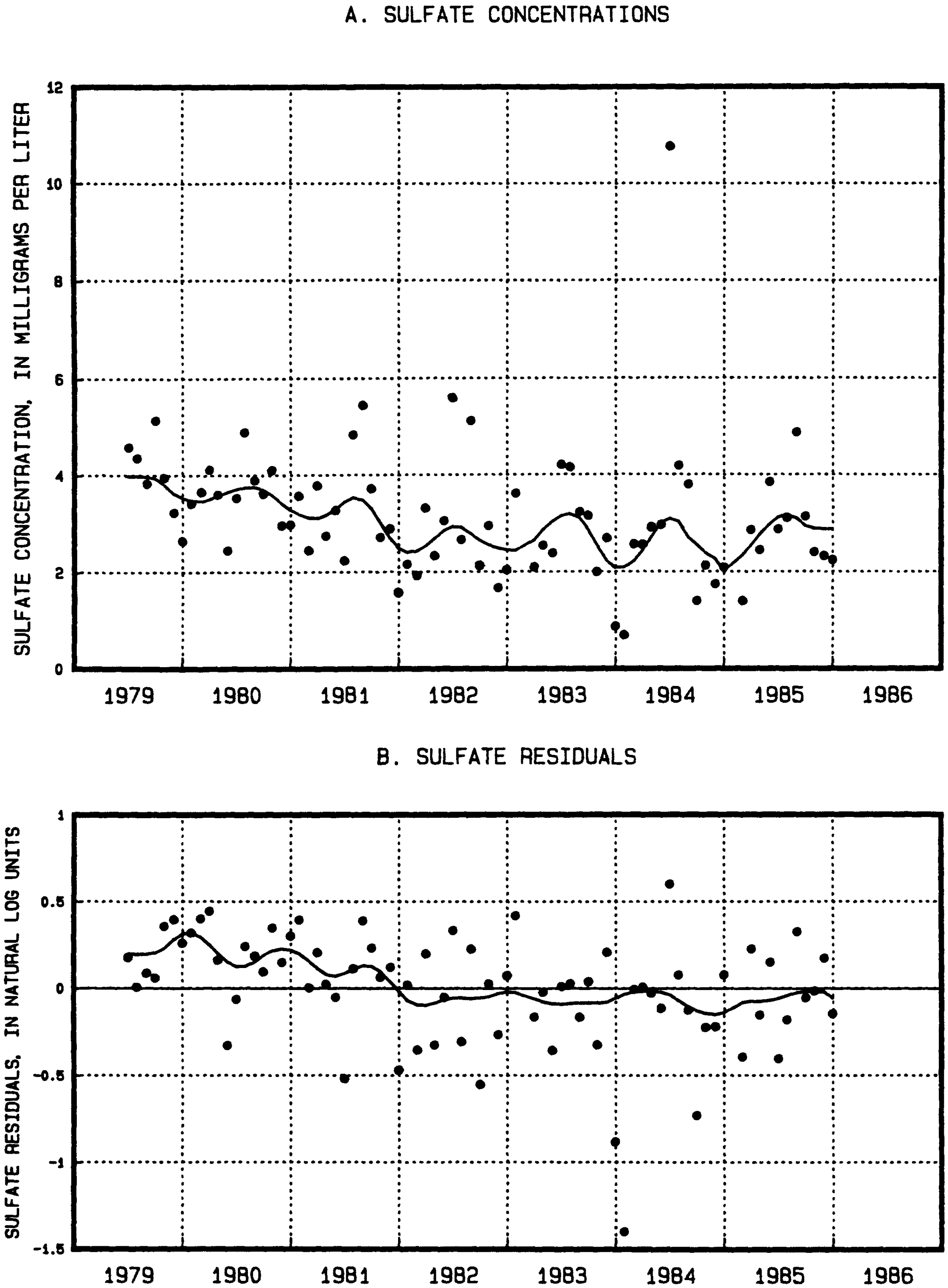
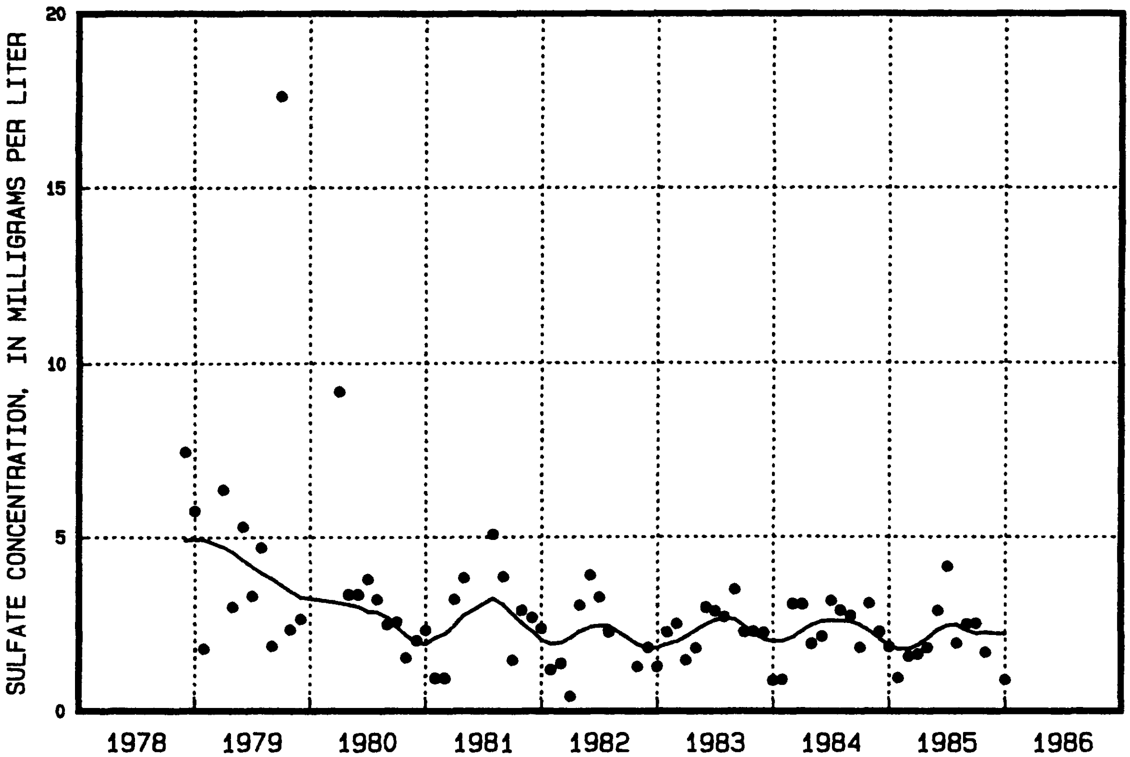


Figure 30.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, Kellogg, Michigan, site 032a.

A. SULFATE CONCENTRATIONS



B. SULFATE RESIDUALS

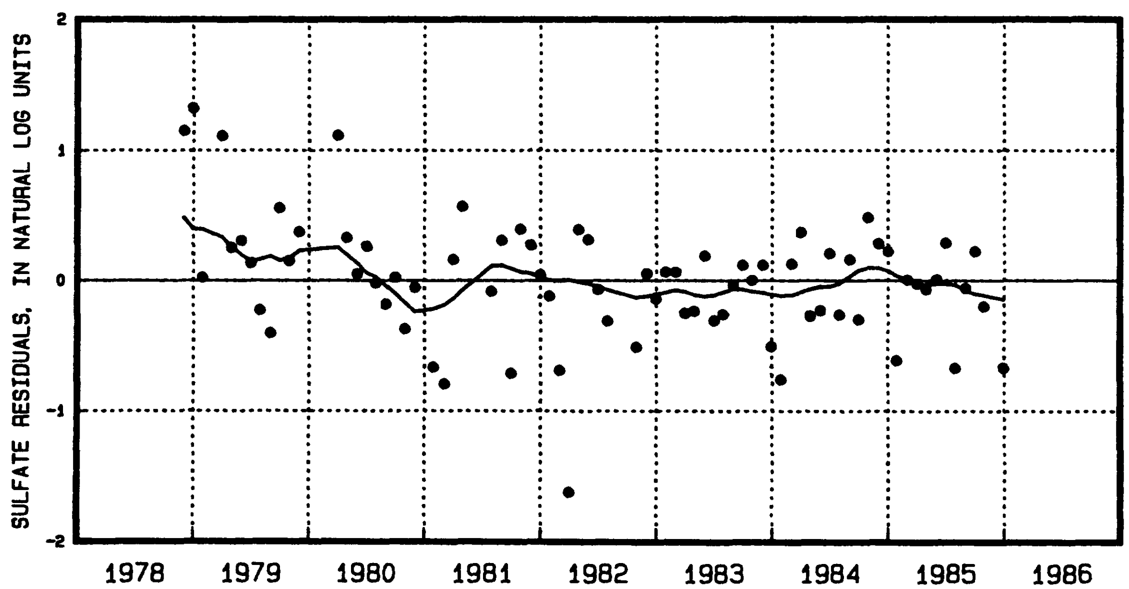
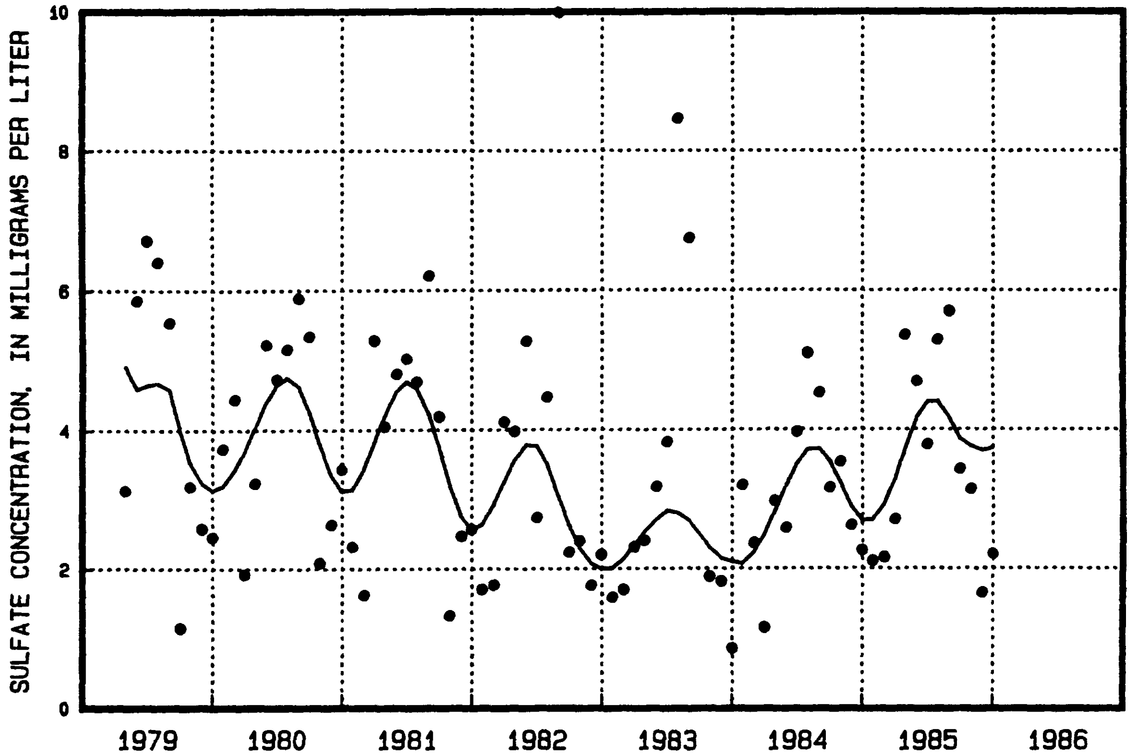


Figure 31.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, Wellston, Michigan, site 033a.

A. SULFATE CONCENTRATIONS



B. SULFATE RESIDUALS

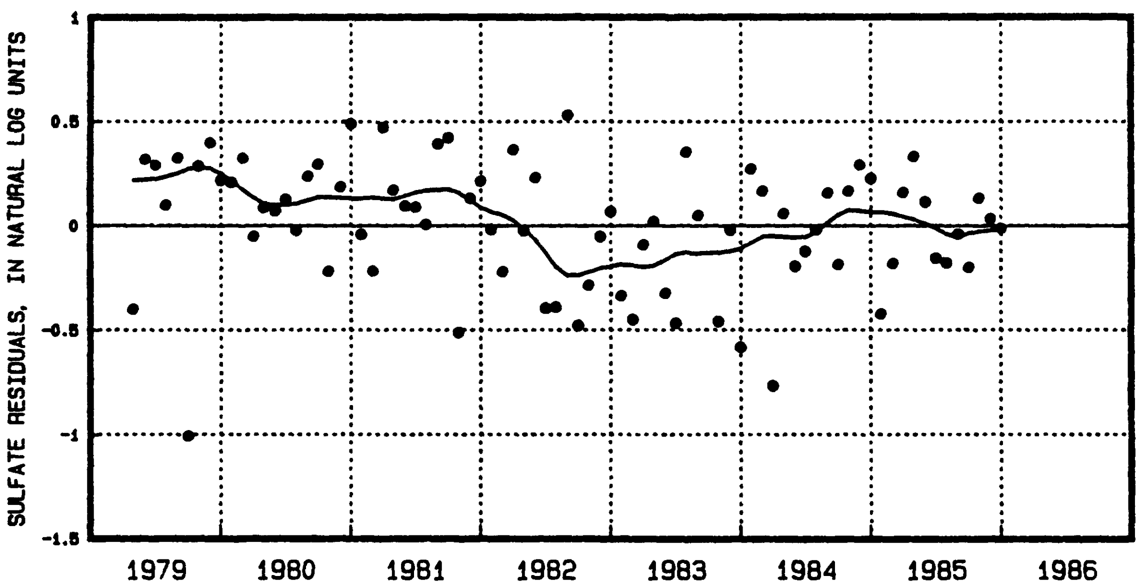
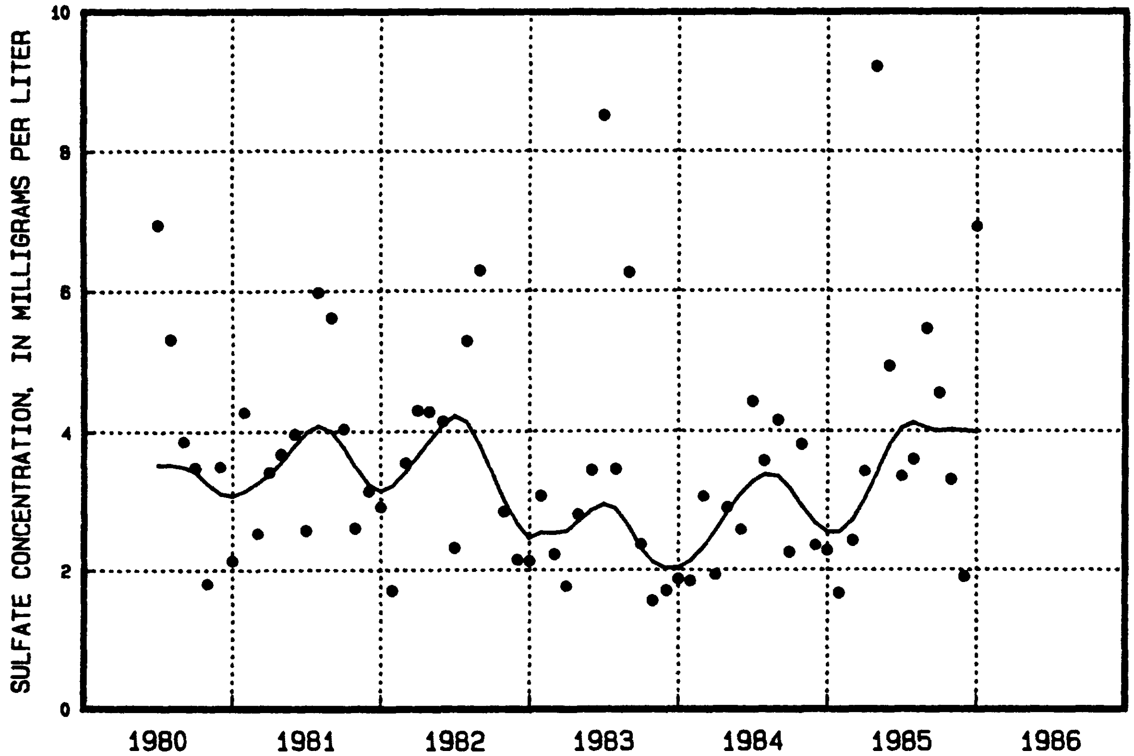


Figure 32.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, Aurora, New York, site 040a.

A. SULFATE CONCENTRATIONS



B. SULFATE RESIDUALS

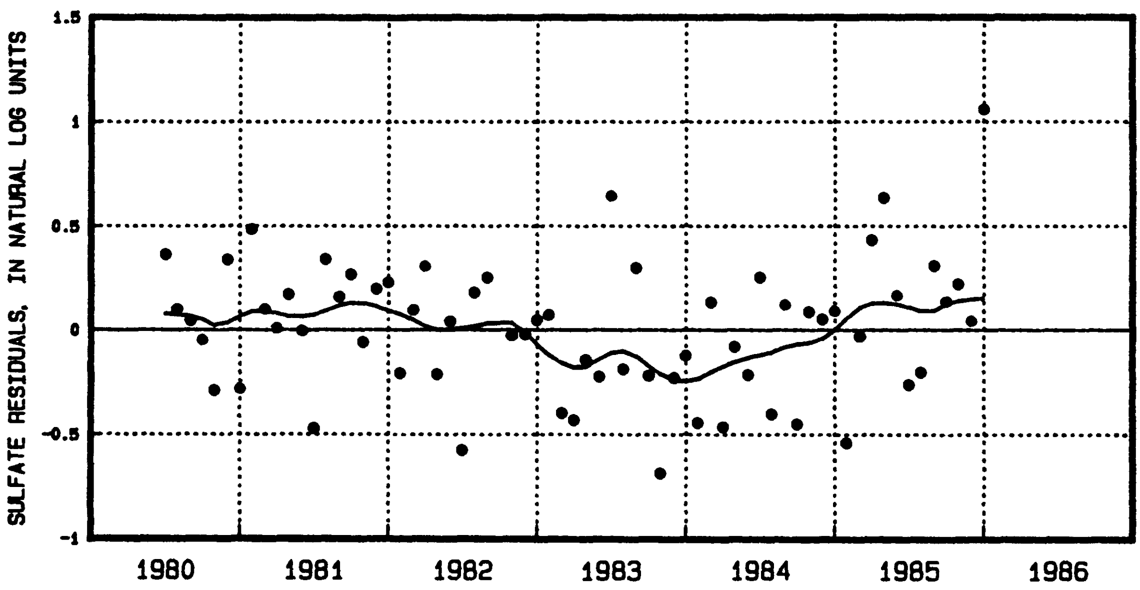


Figure 33.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, Chautauqua, New York, site 041a.

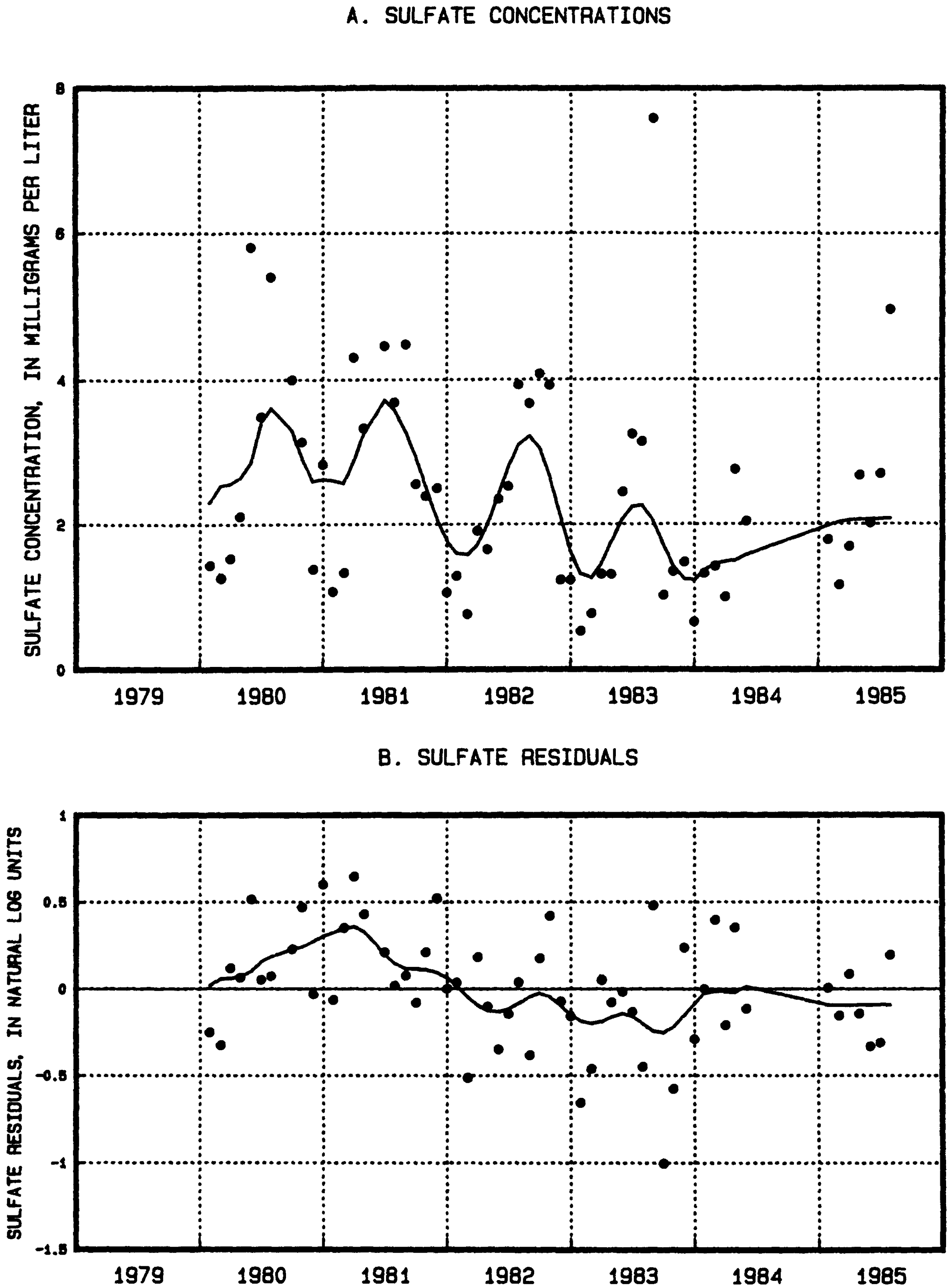
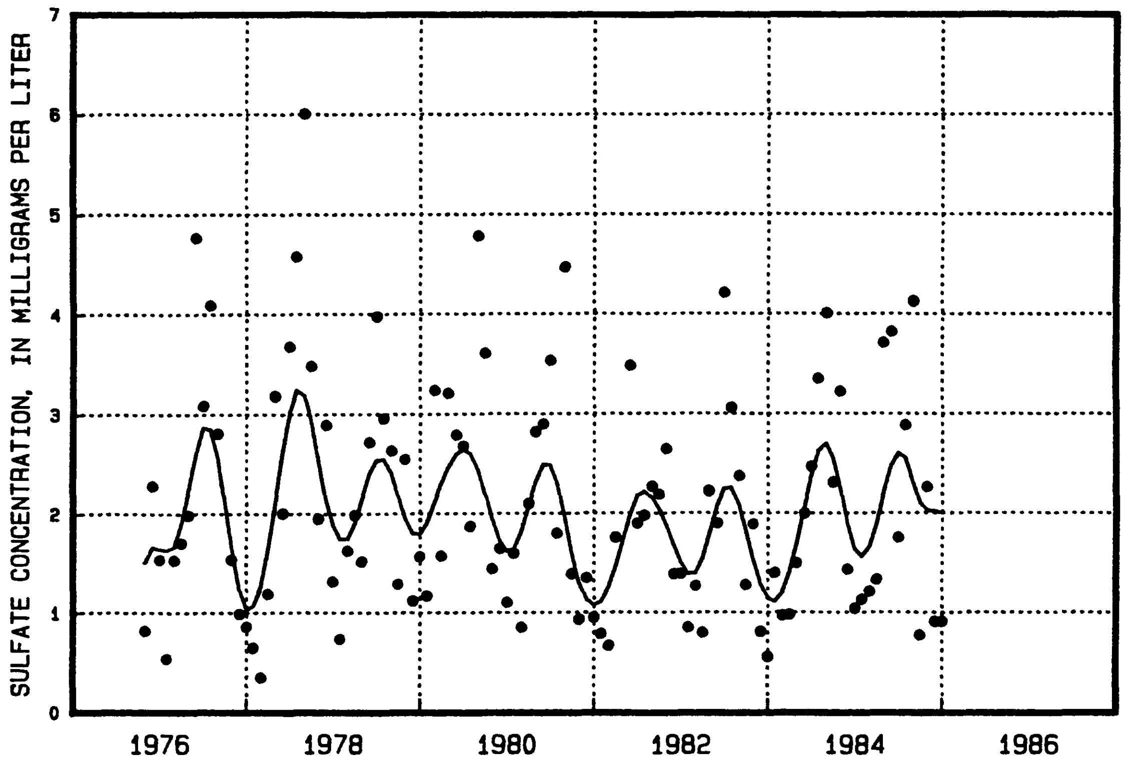


Figure 34.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, Knobit, New York, site 042a.

A. SULFATE CONCENTRATIONS



B. SULFATE RESIDUALS

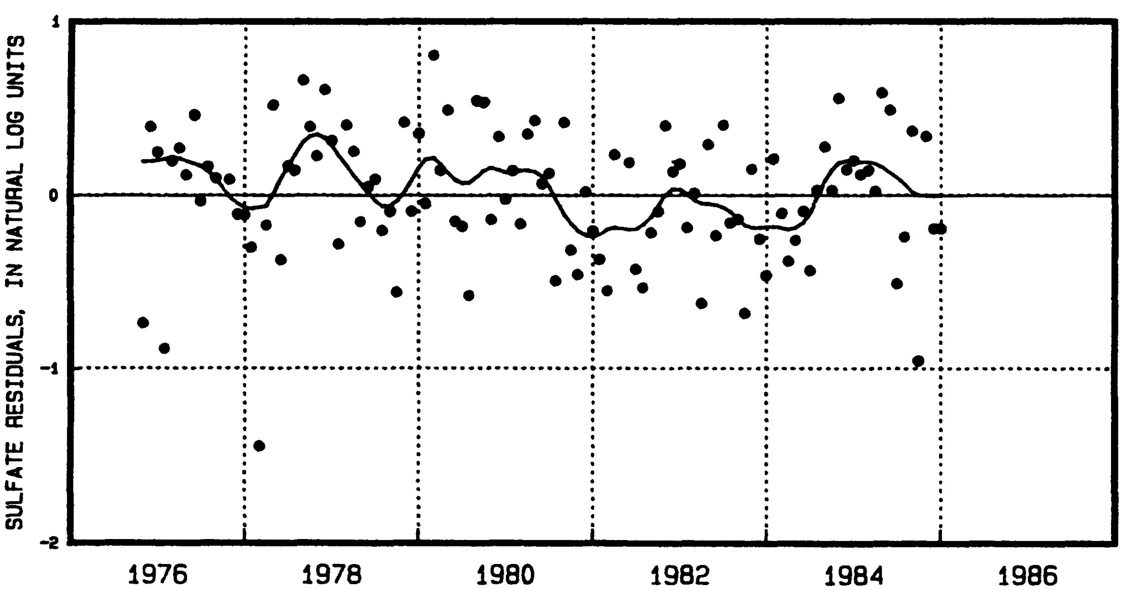


Figure 35.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation for Whiteface, New York, site 043a.

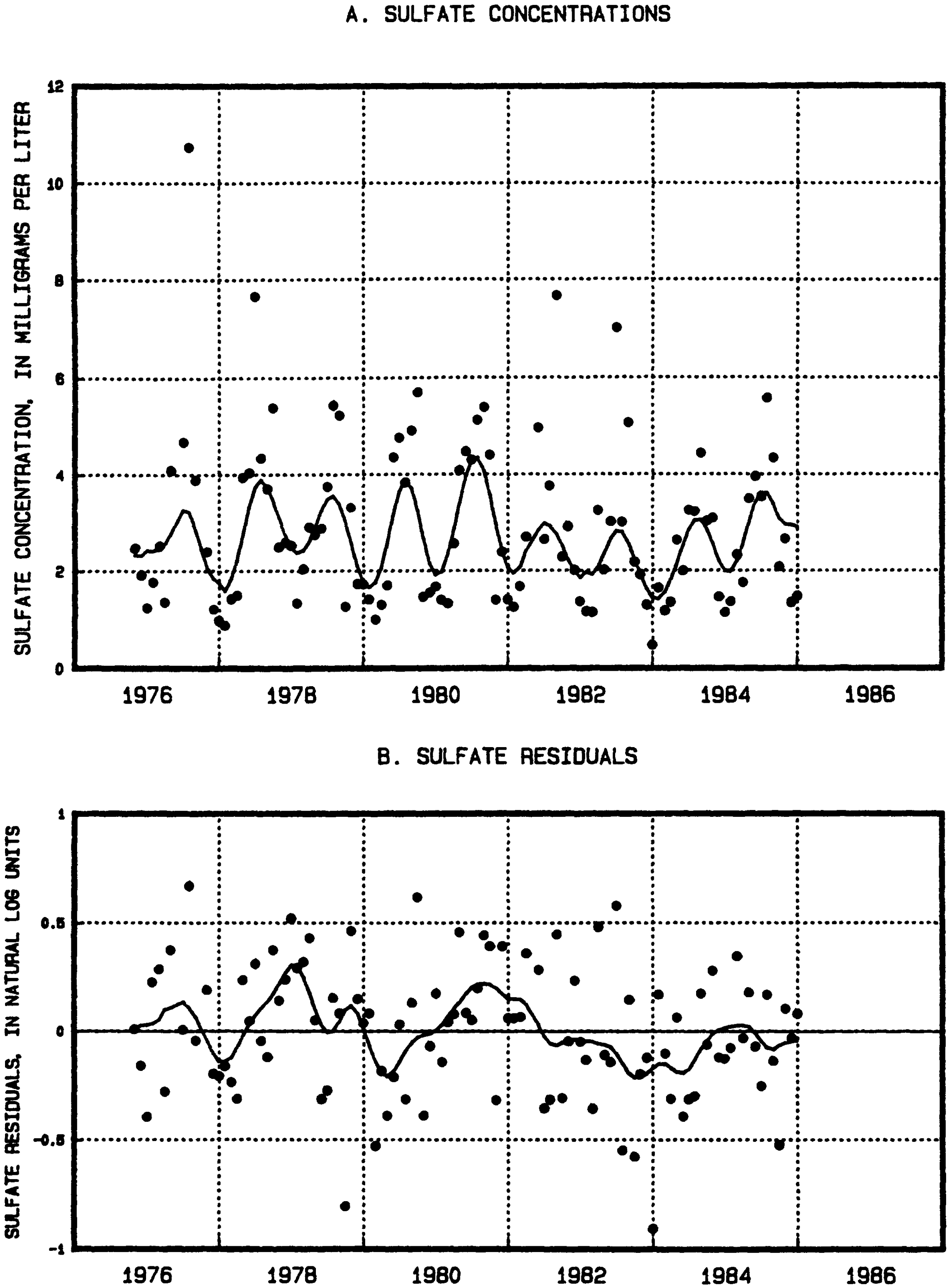


Figure 36.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, Ithaca, New York, site 044a.

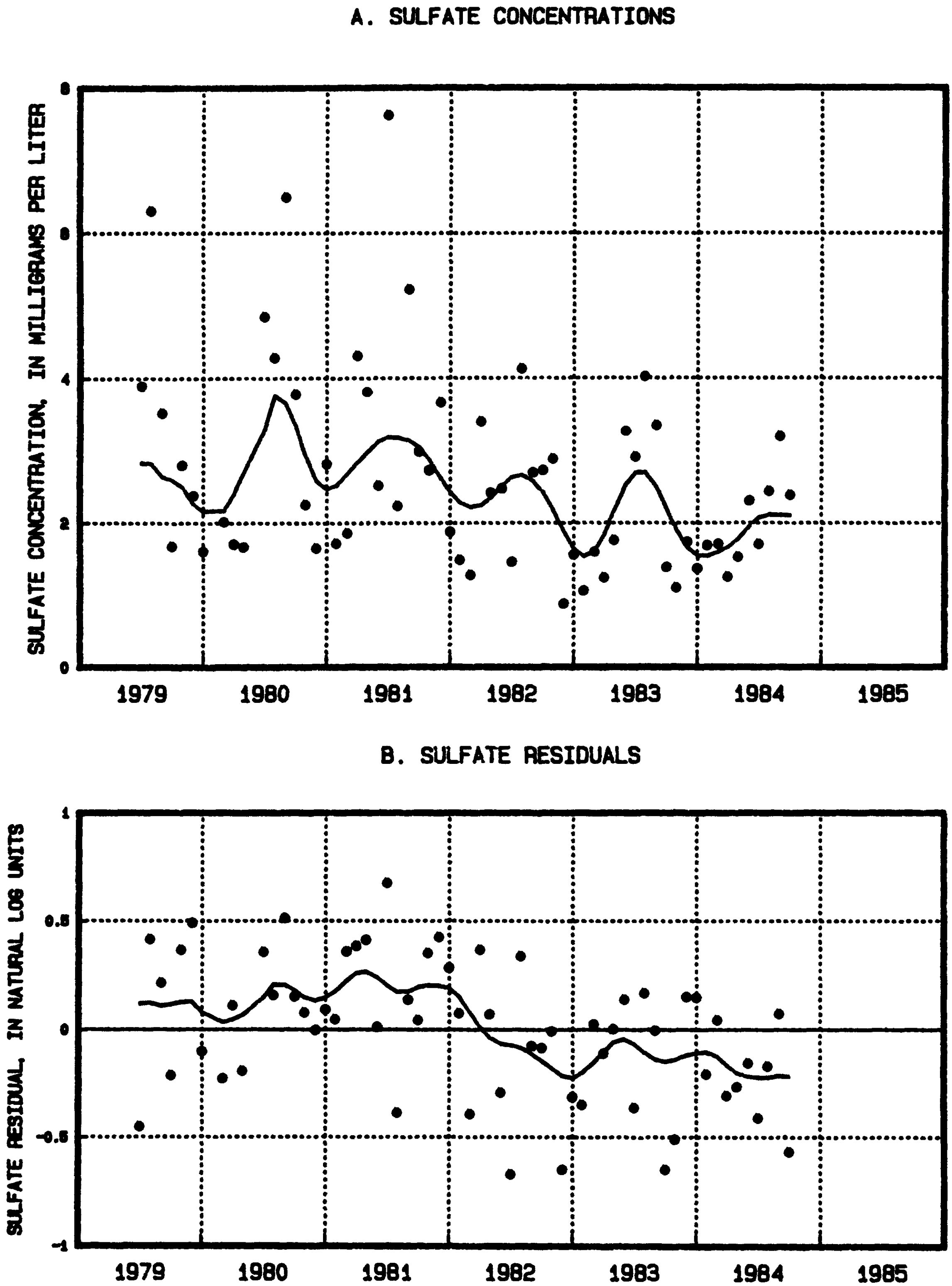


Figure 37.--Smoothed (A) sulfate concentrations and (B) regression residuals adjusted for season and amount of precipitation, Stilwell Lake, New York, site 045a.

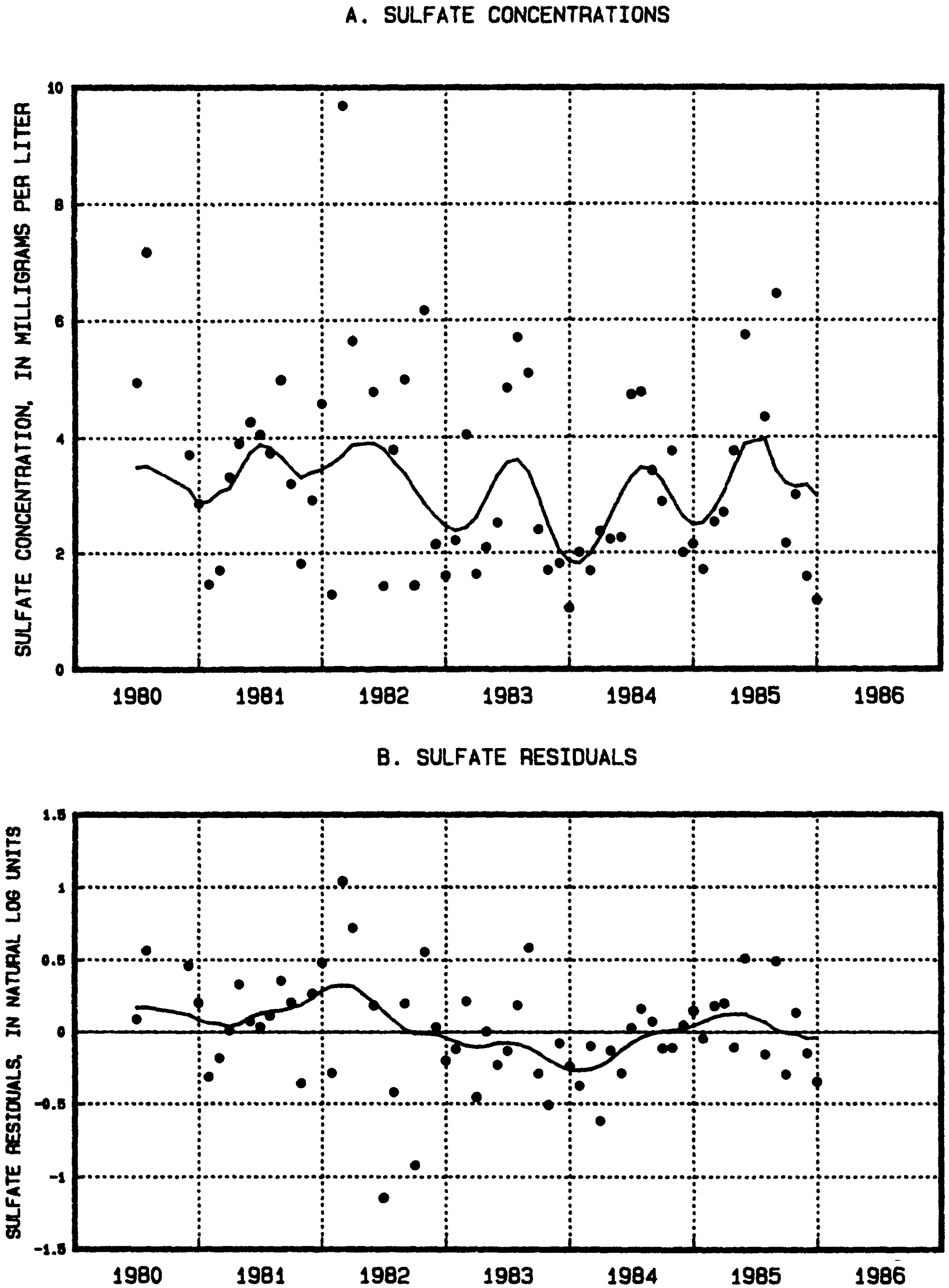


Figure 38.--Smoothed (A) sulfate concentrations and (B) regression residuals adjusted for season and amount of precipitation, Bennett Bridge, New York, site 046a.

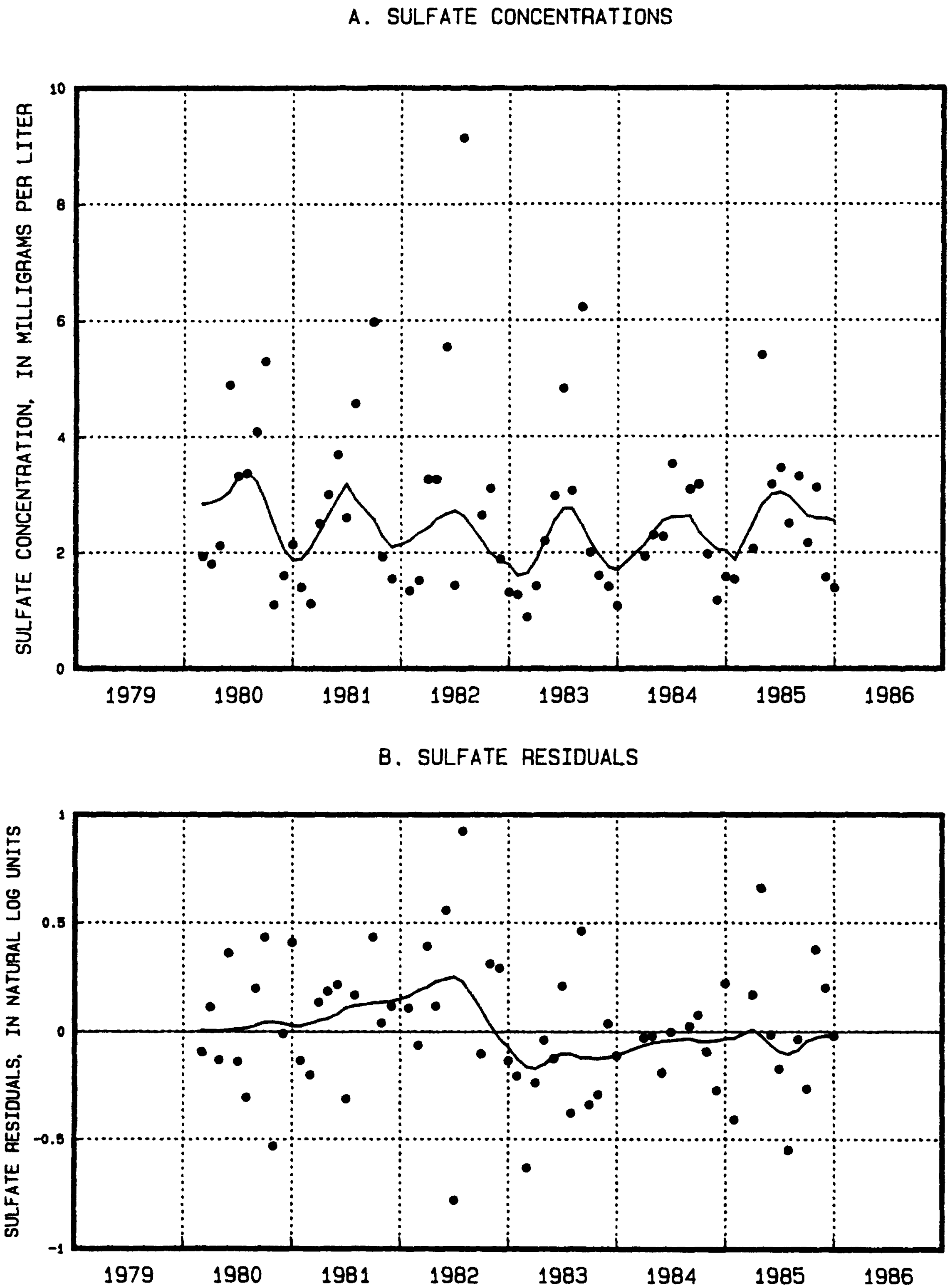


Figure 39.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, Jasper, New York, site 047a.

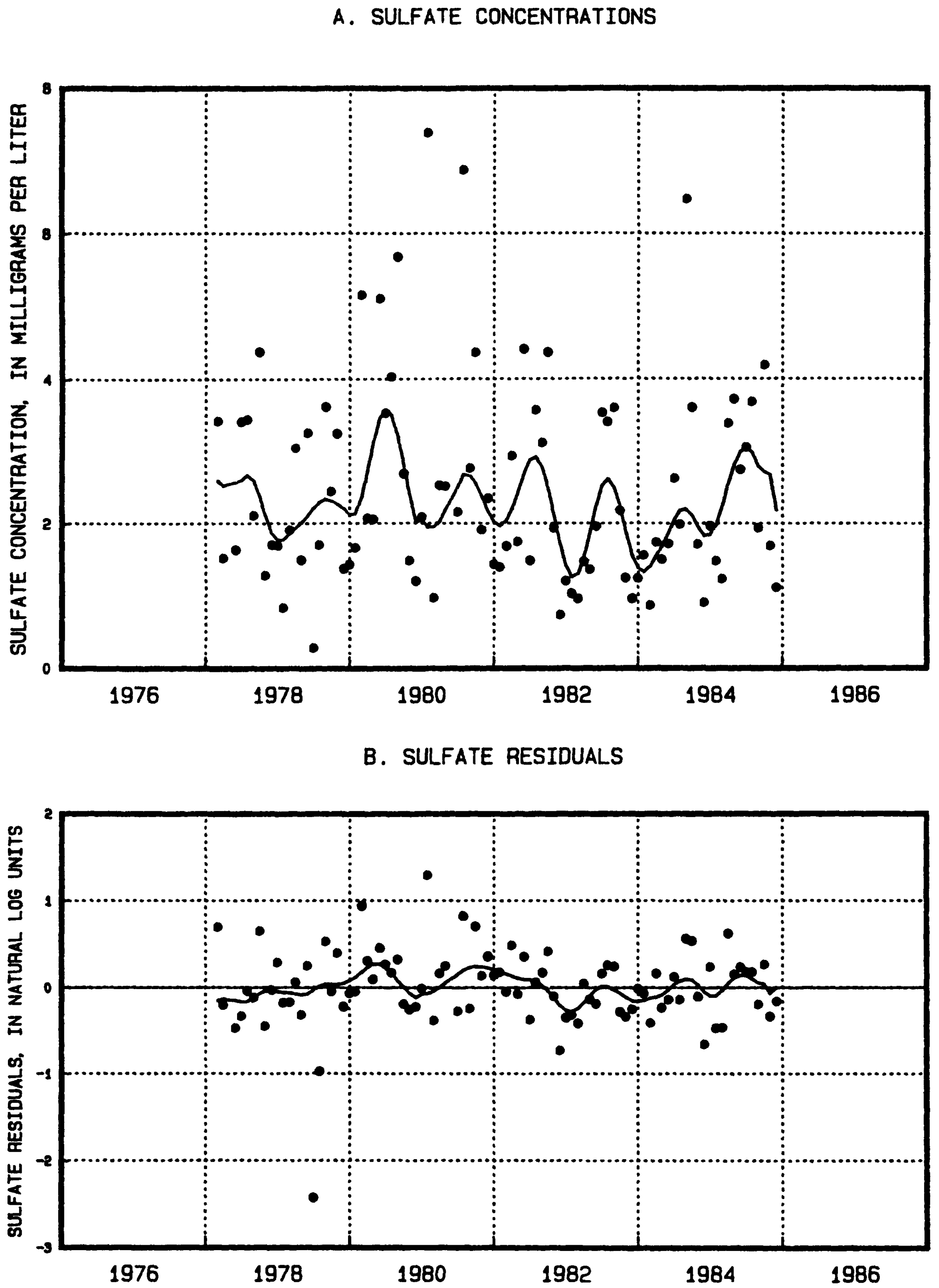


Figure 40.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, Brookhaven, New York, site 048a.

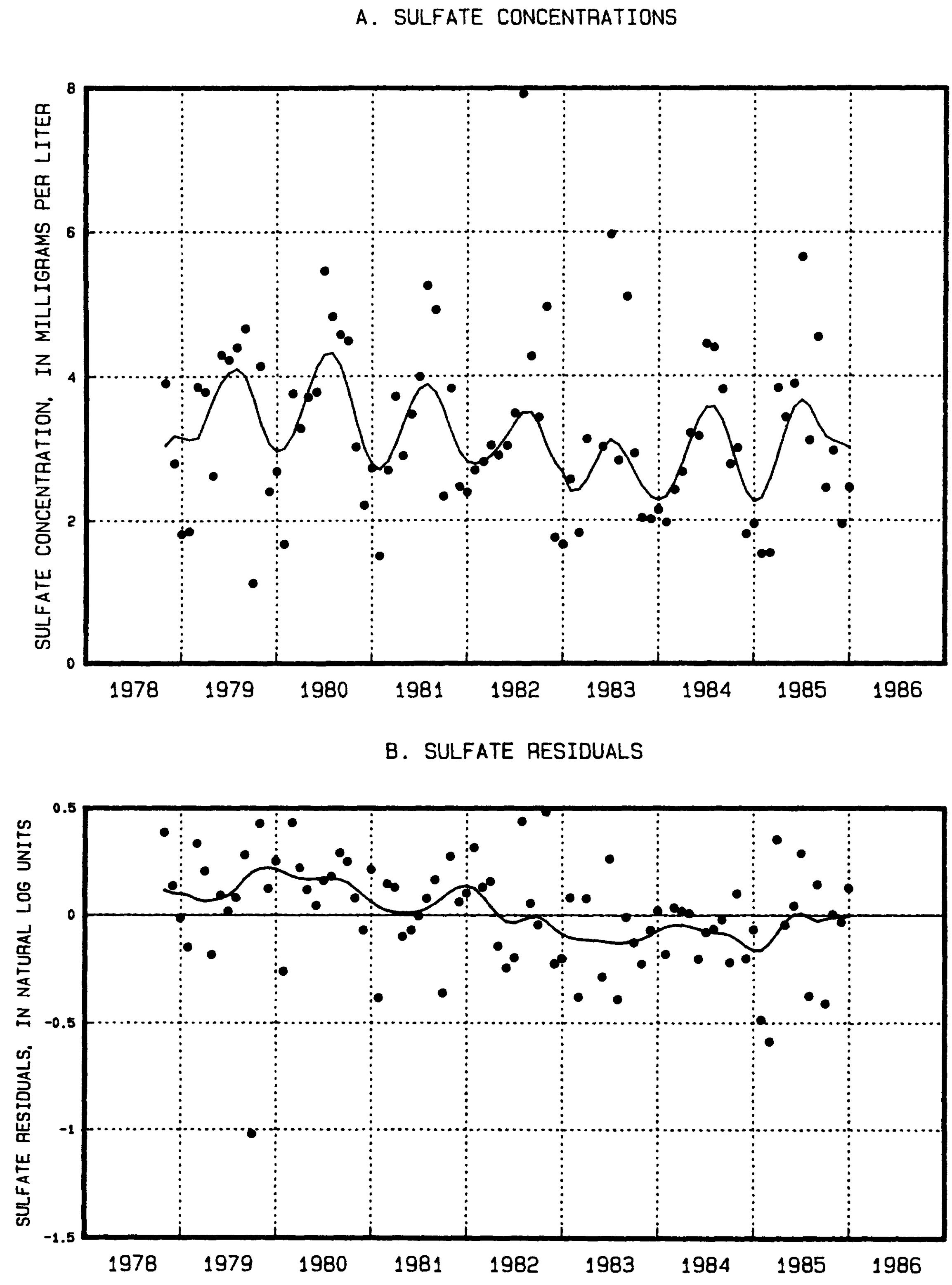


Figure 41.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, Delaware, Ohio, site 055a.

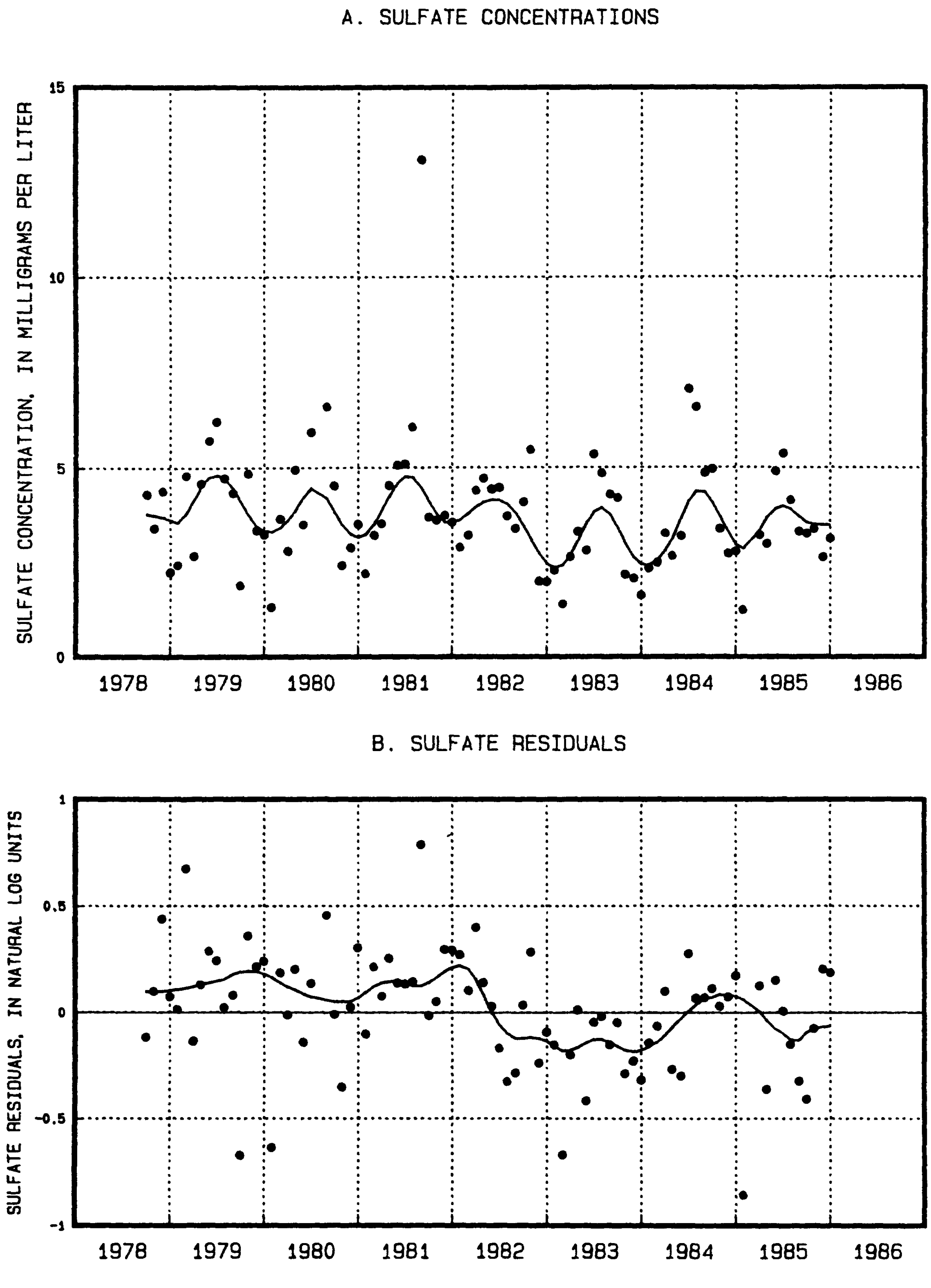


Figure 42.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, Caldwell, Ohio, site 056a.

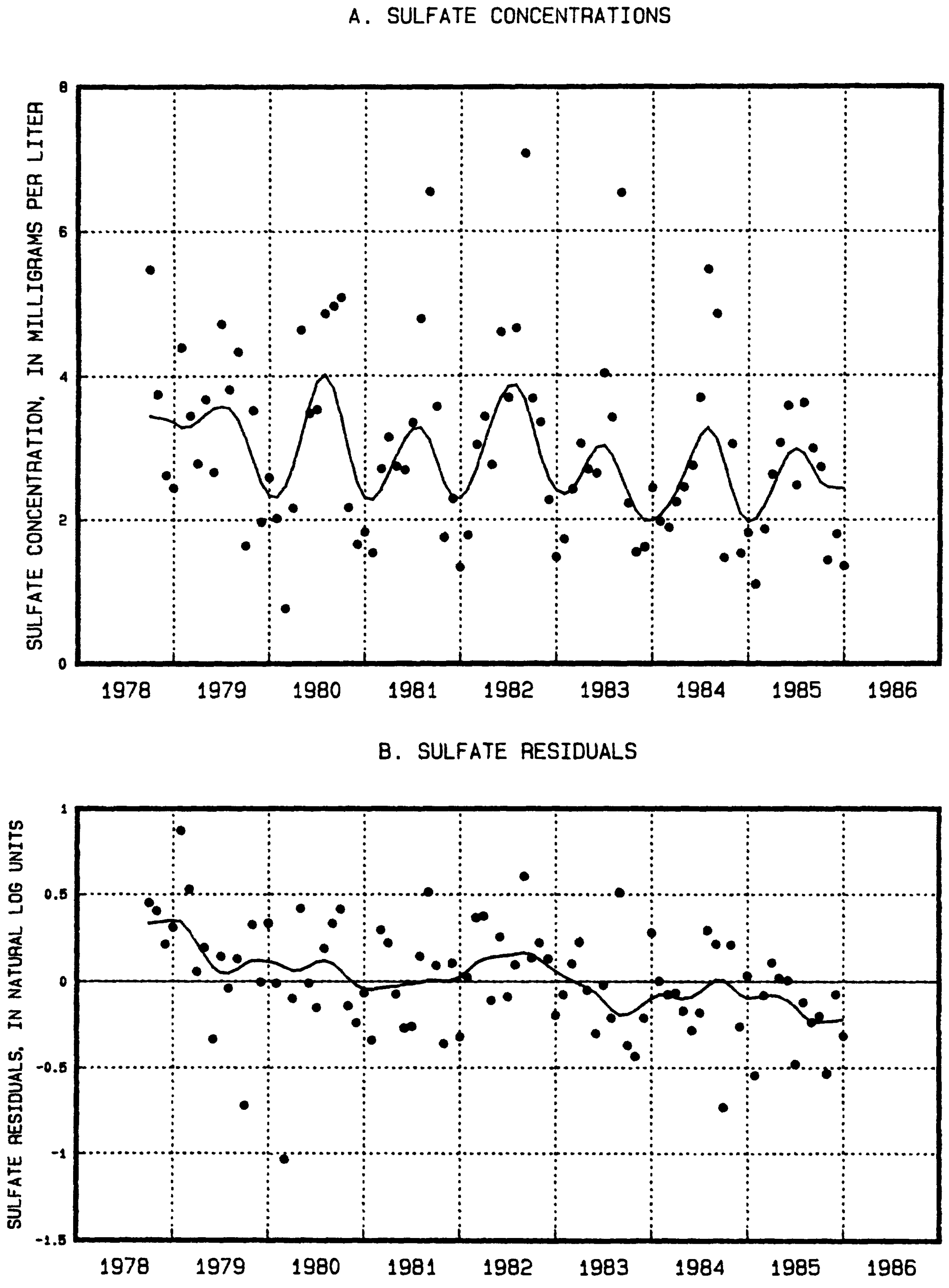


Figure 43.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, Delaware, Ohio, site 057a.

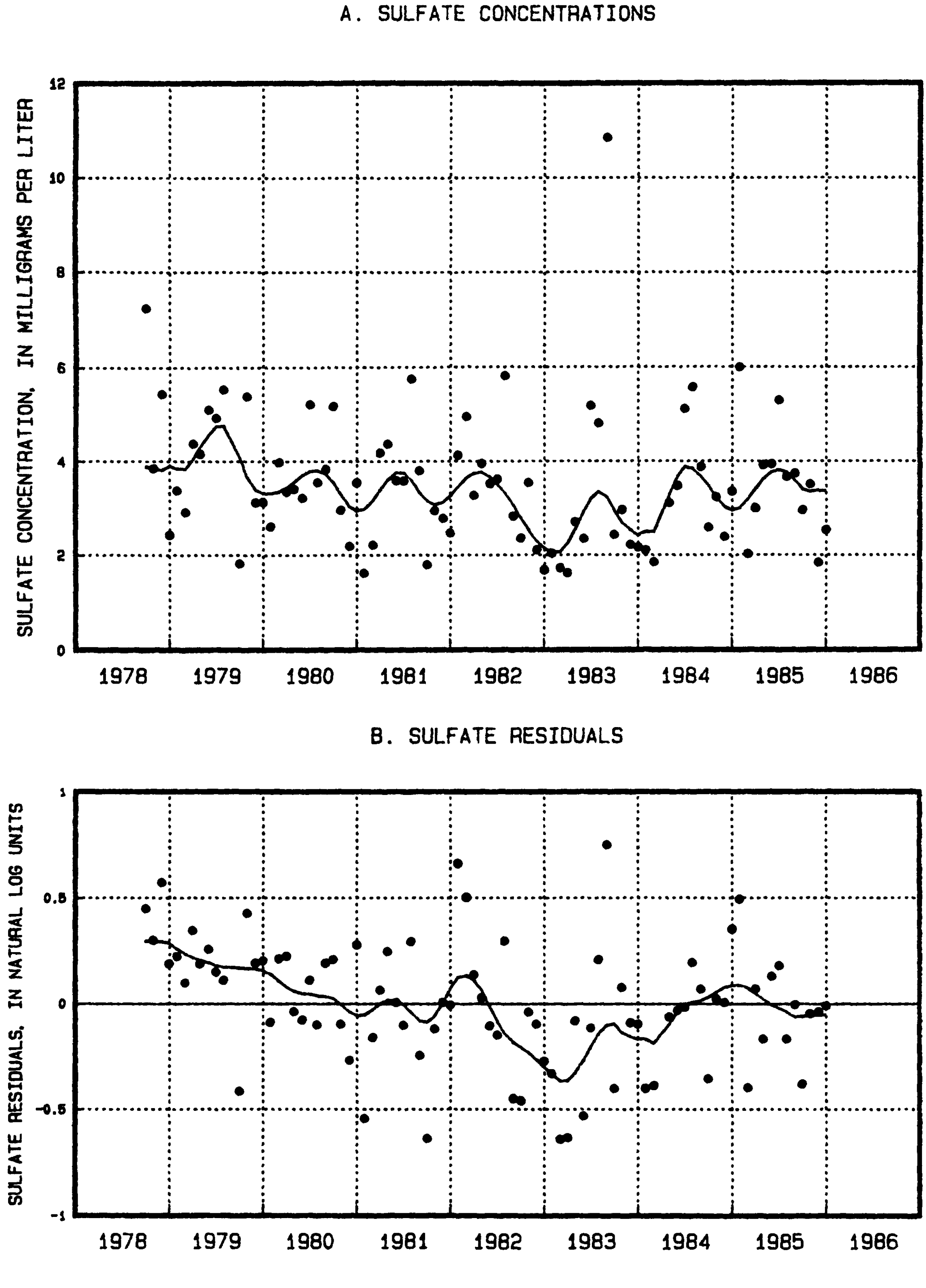


Figure 44.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, Wooster, Ohio, site 058a.

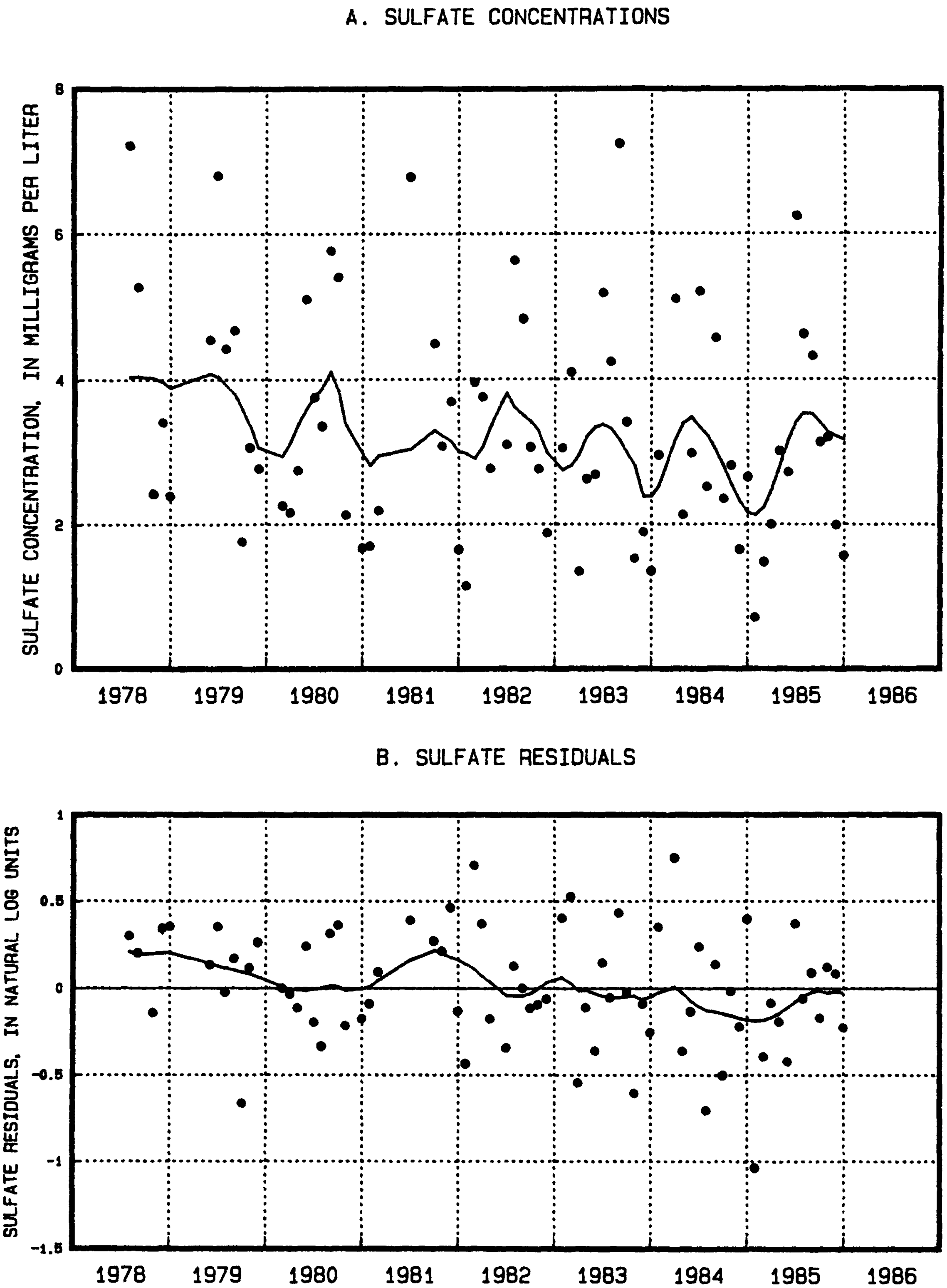


Figure 45.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, Kane, Pennsylvania, site 063a.

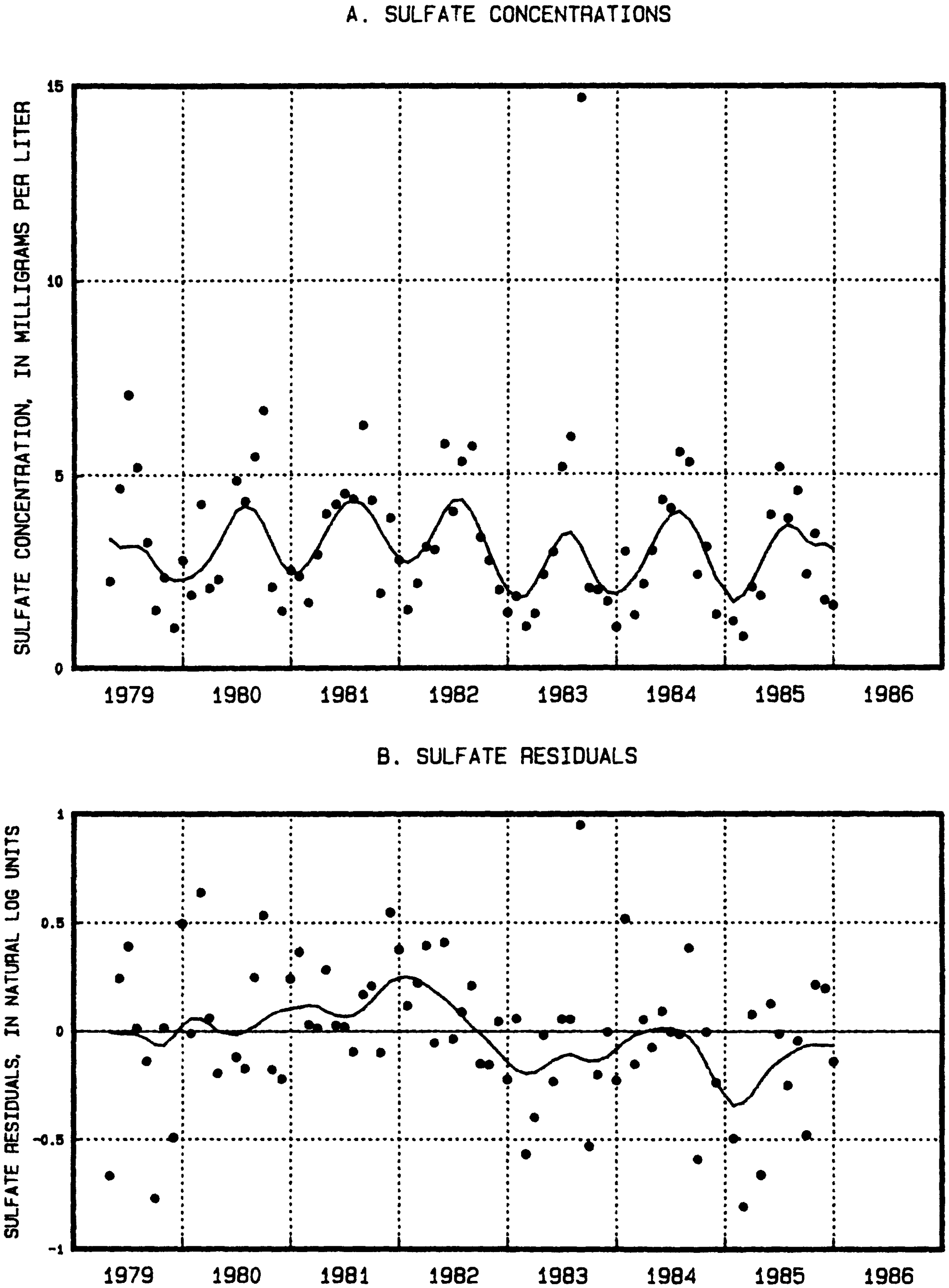


Figure 46.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, Leading Ridge, Pennsylvania, site 064a.

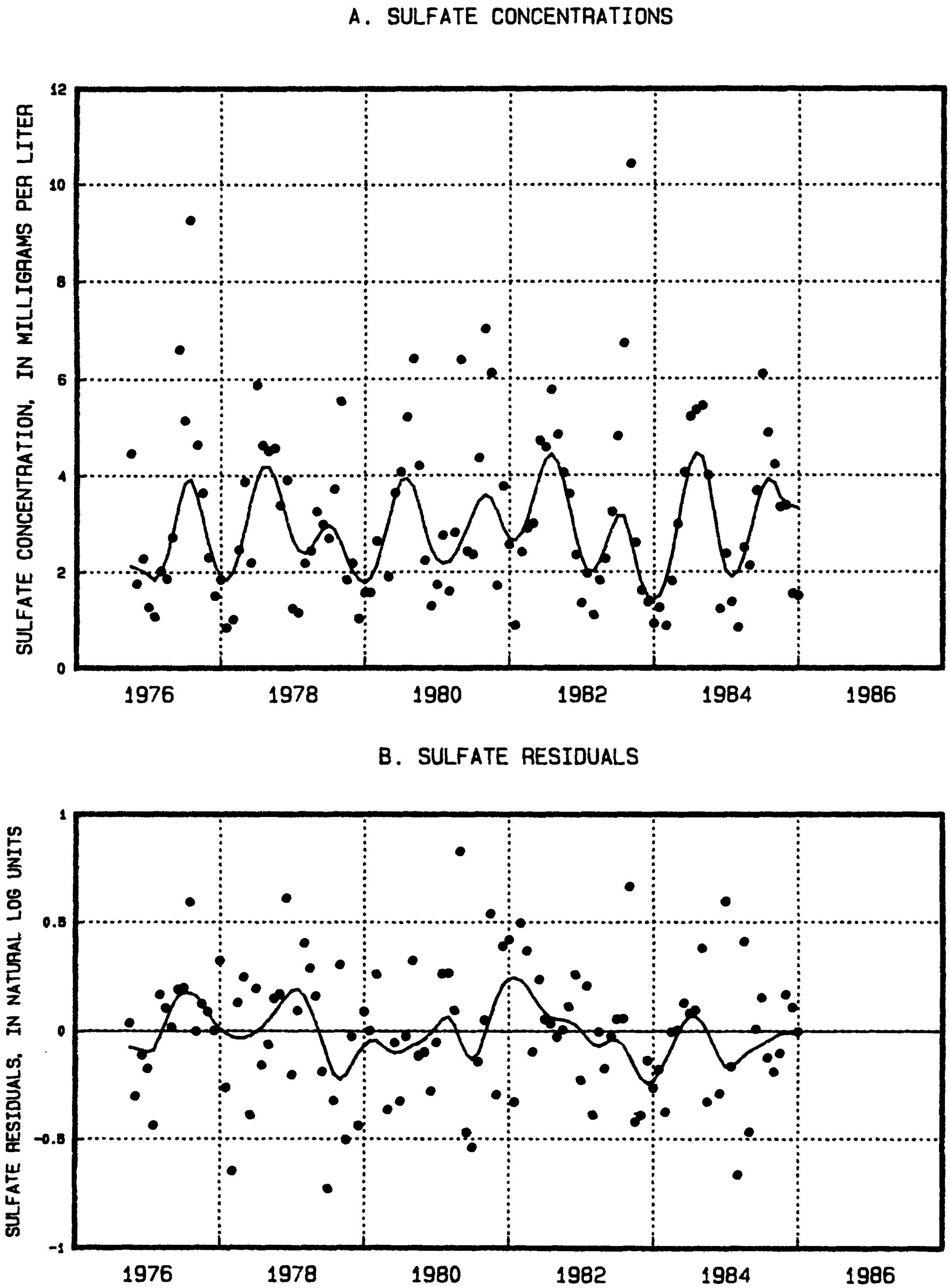


Figure 47.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, Penn State, Pennsylvania, site 065a.

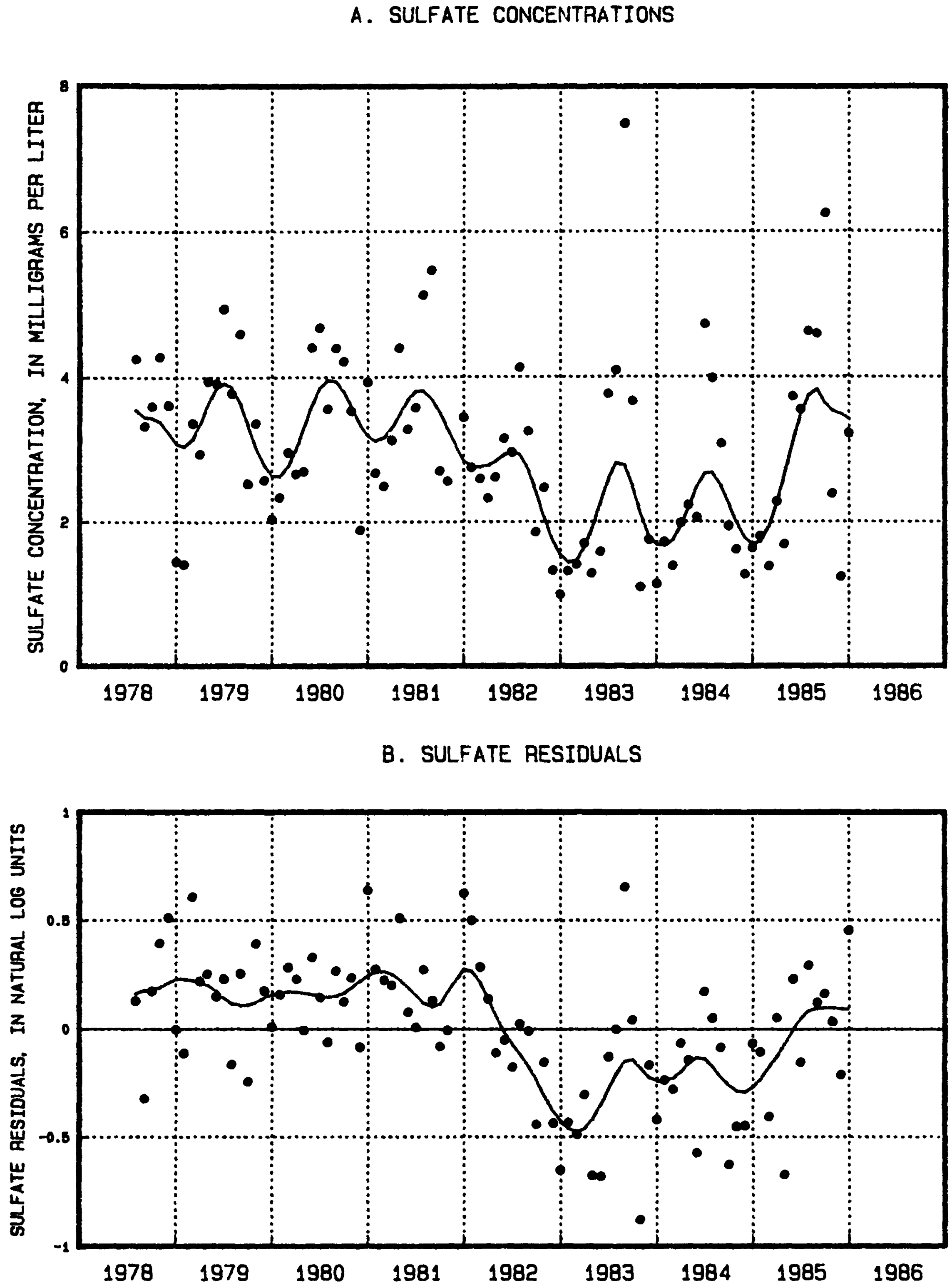
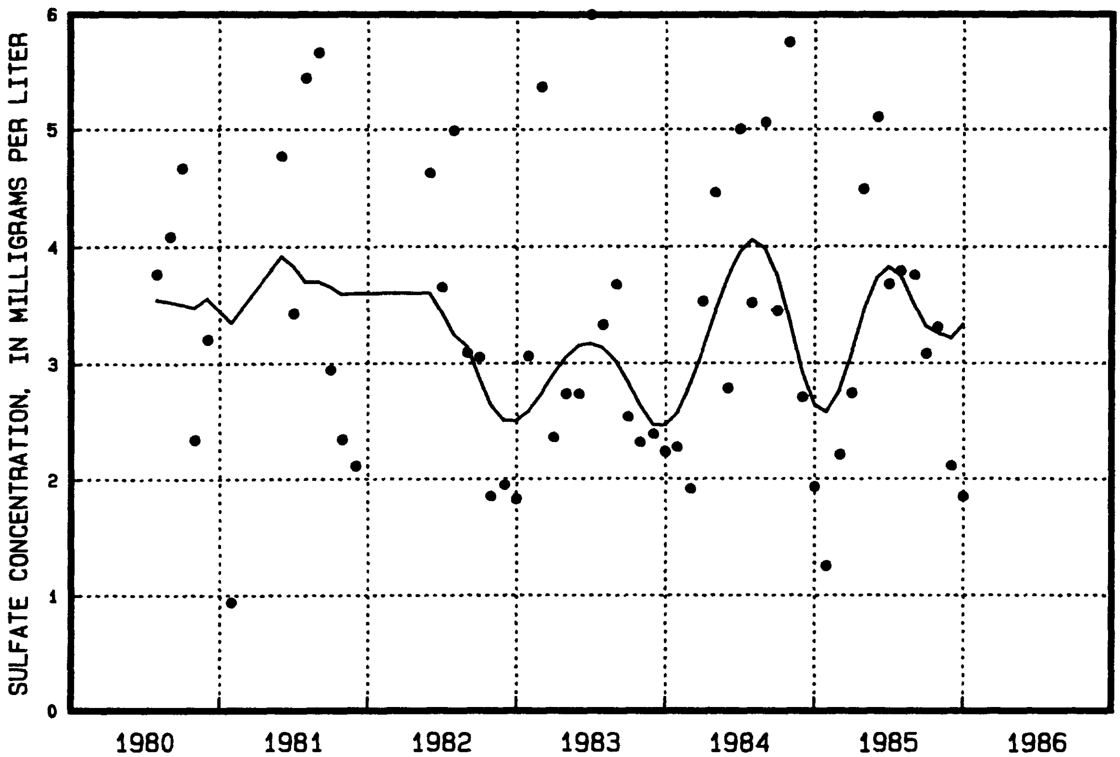


Figure 48.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, Parsons, West Virginia, site 075a.

A. SULFATE CONCENTRATIONS



B. SULFATE RESIDUALS

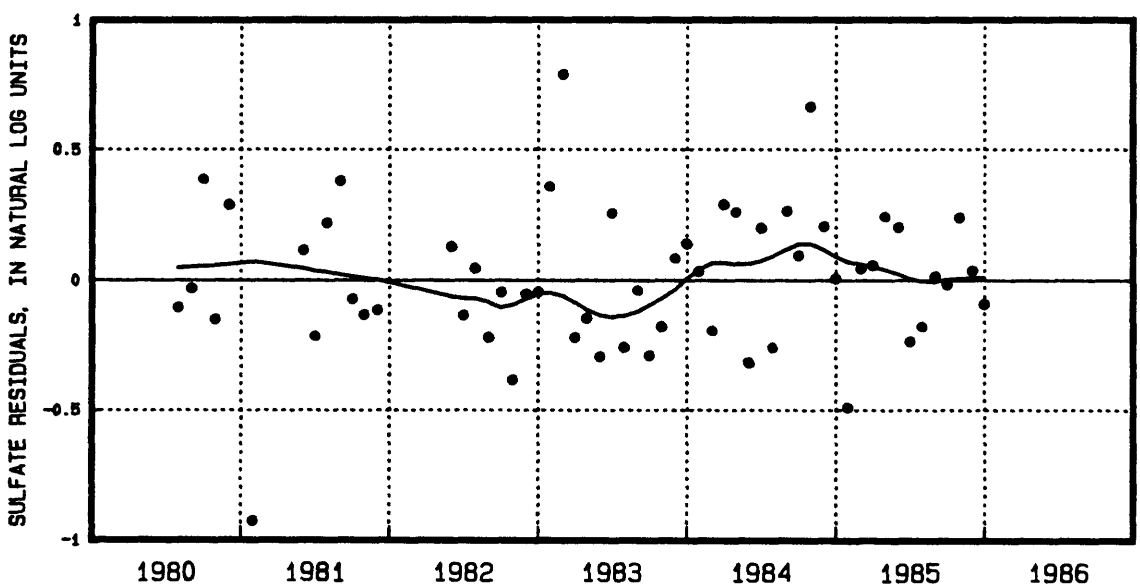


Figure 49.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, Longwoods, Ontario, site 143b.

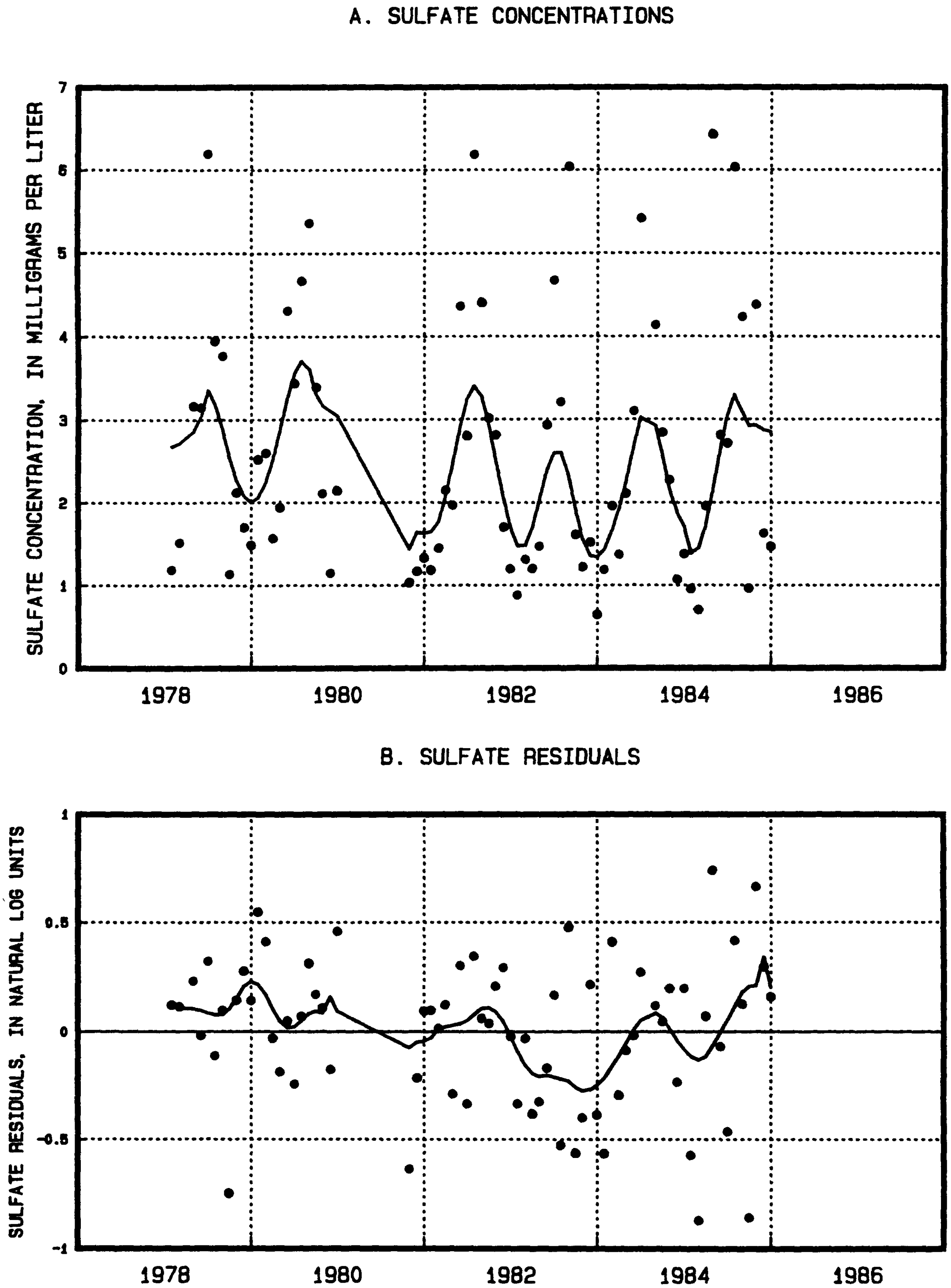


Figure 50.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, Scranton, Pennsylvania, site 151a.

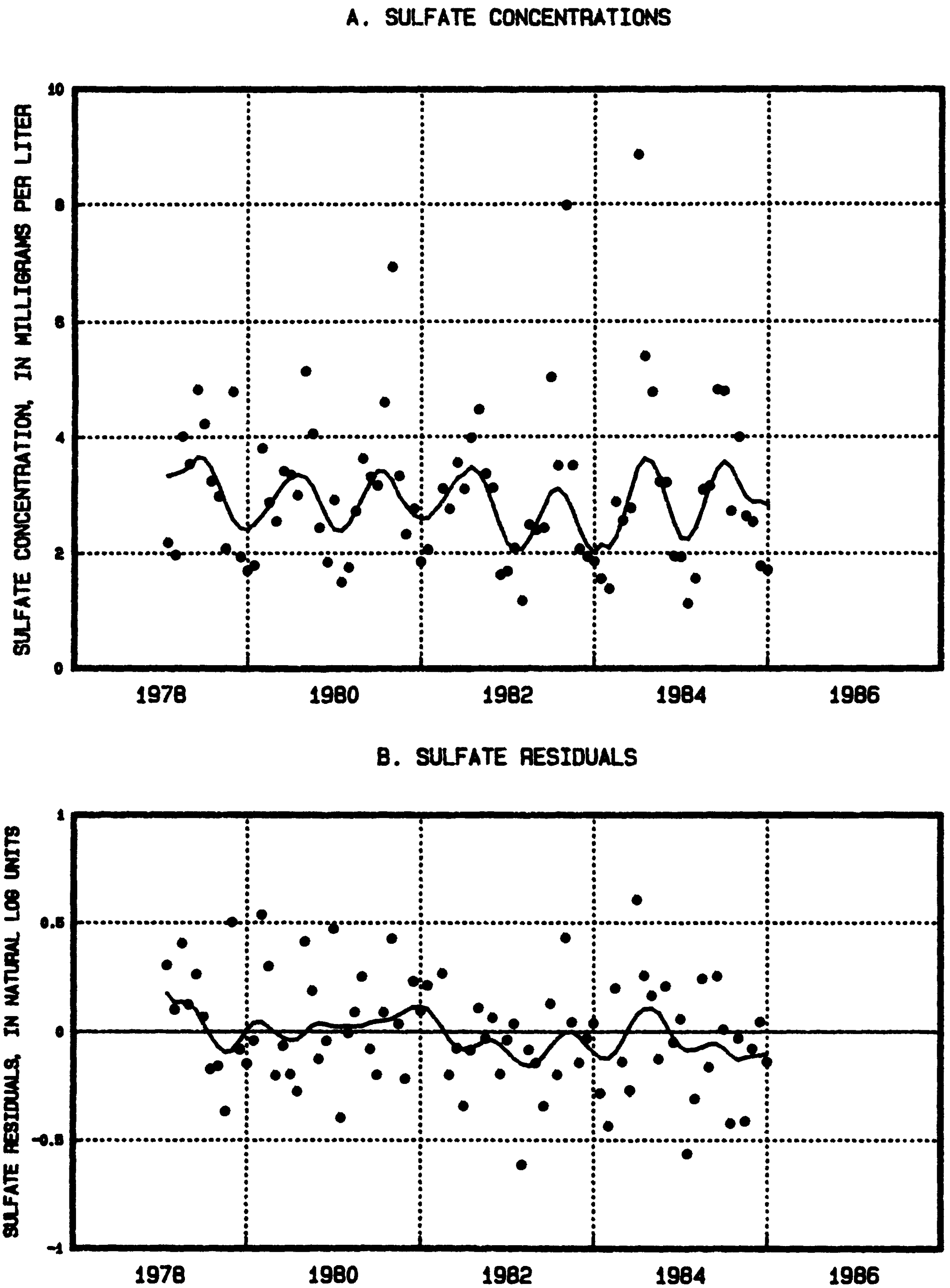


Figure 51.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, Zanesville, Ohio, site 153a.

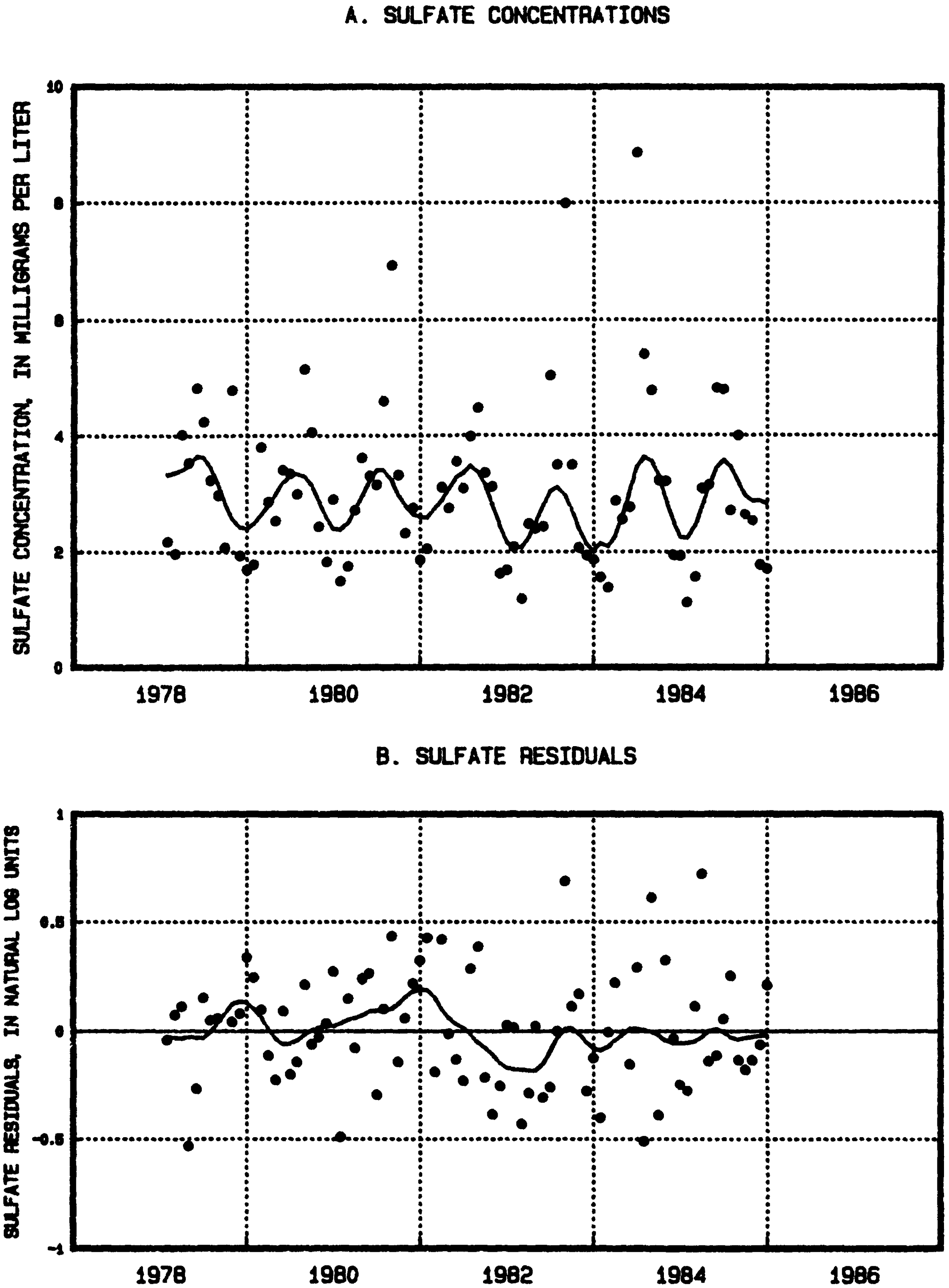


Figure 52.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, Rockport, Indiana, site 154a.

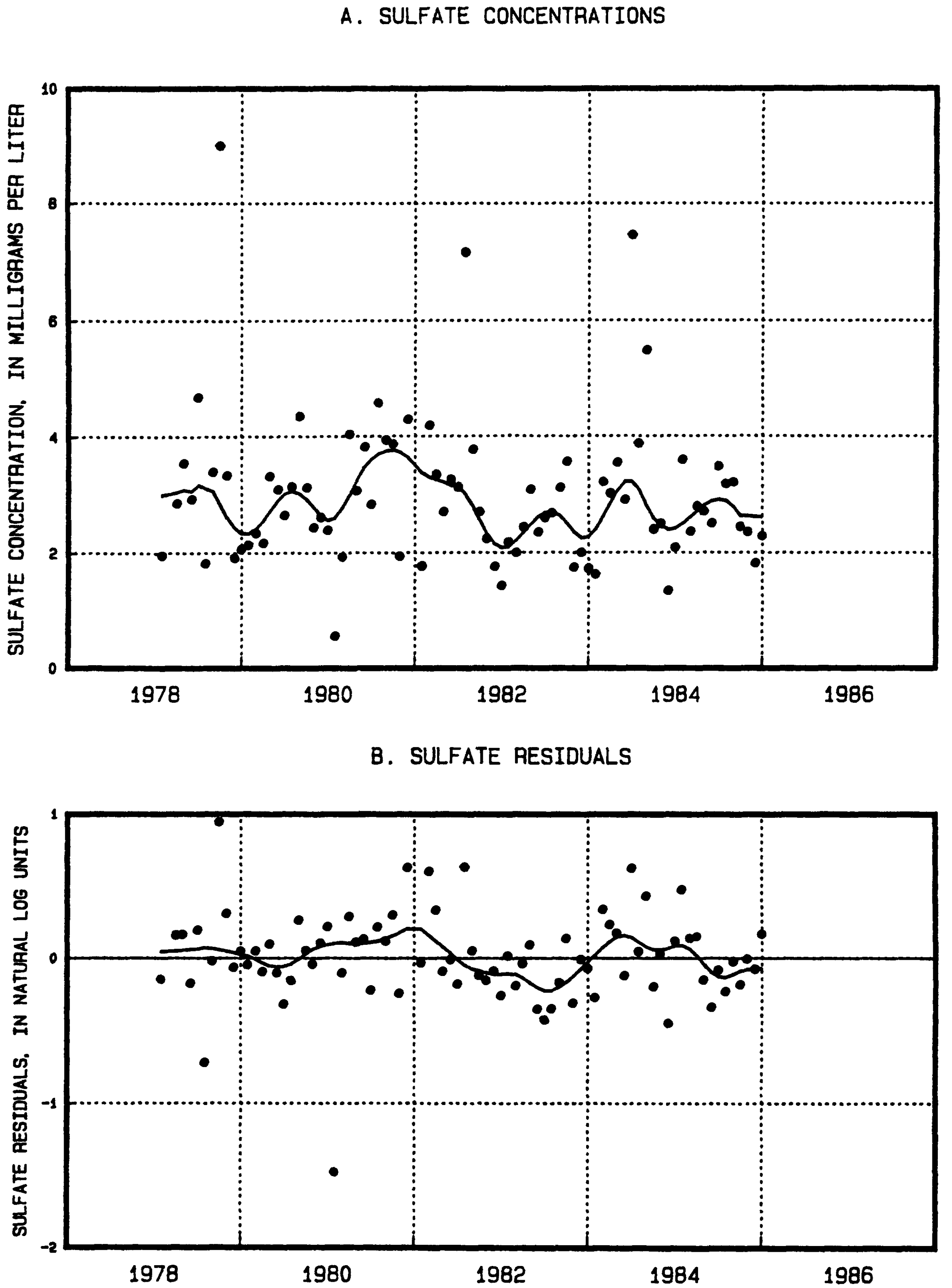
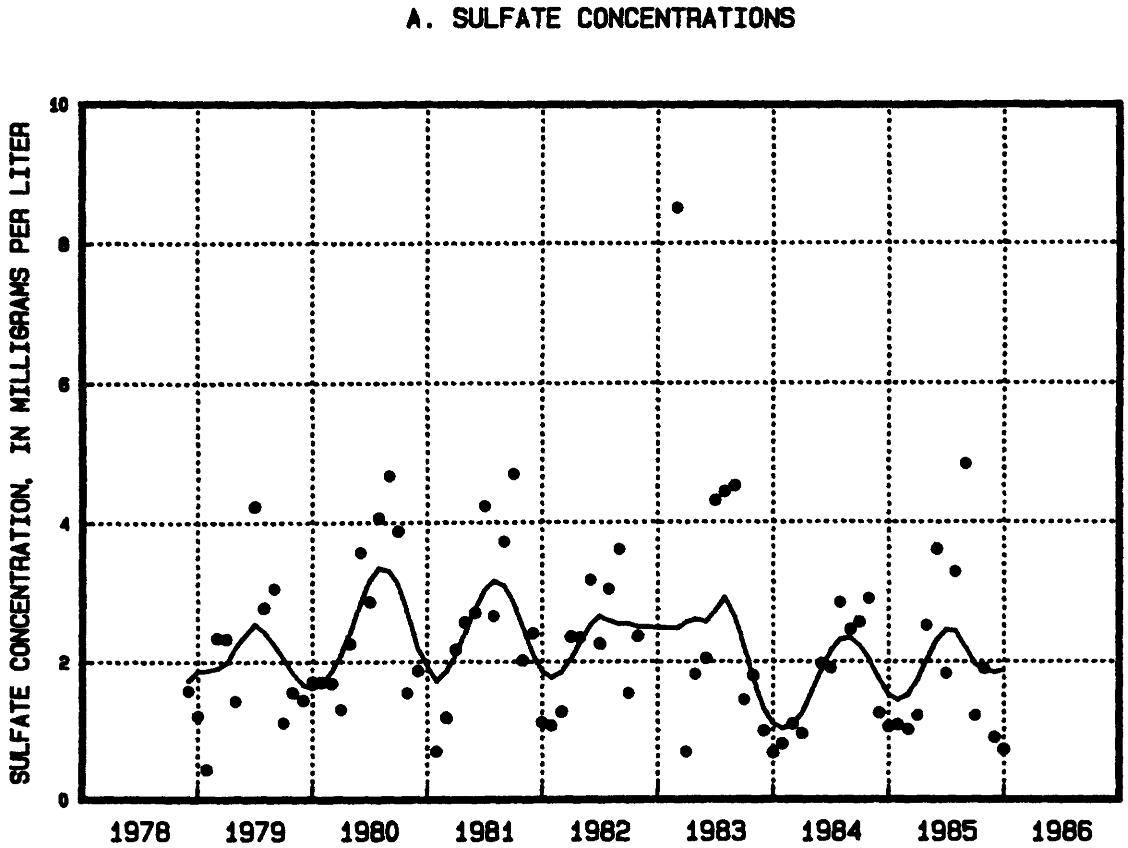


Figure 53.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, Fort Wayne, Indiana, site 156a.



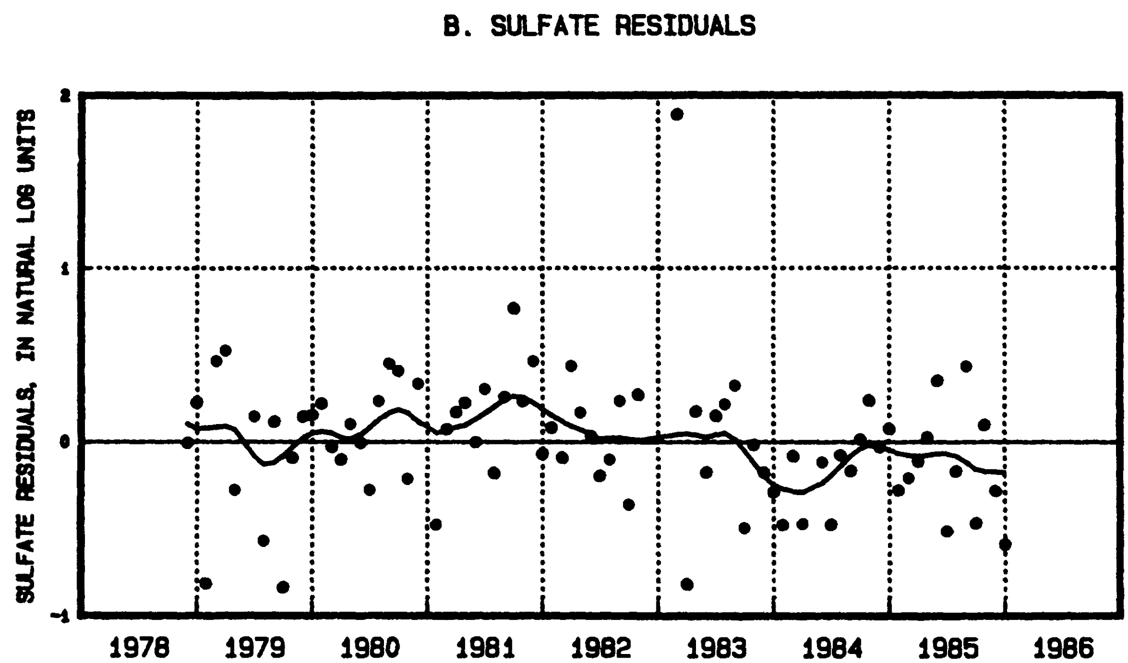


Figure 54.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, Huntington, New York, site 168a.

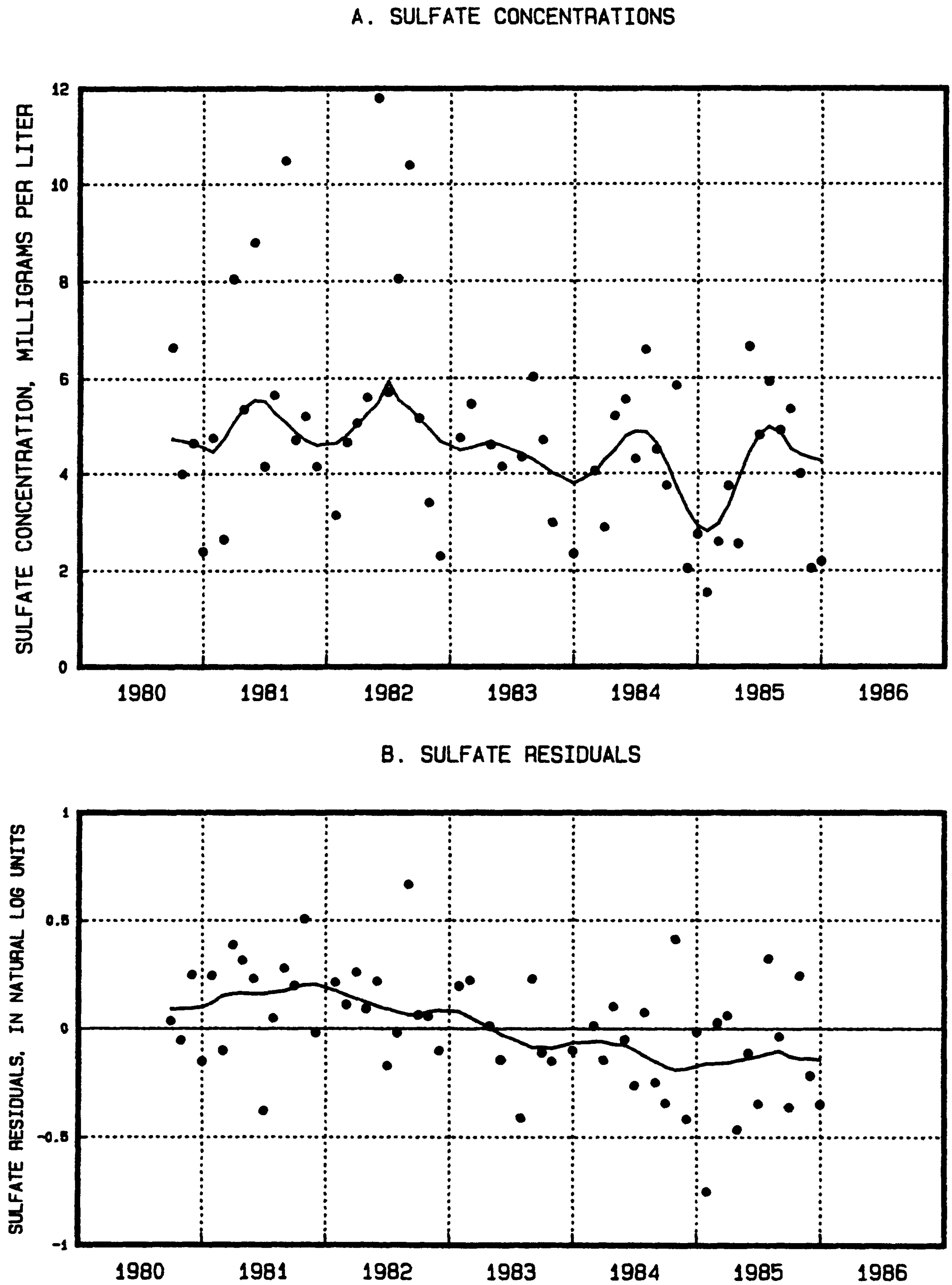


Figure 55.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, Colchester, Ontario, site 176a.

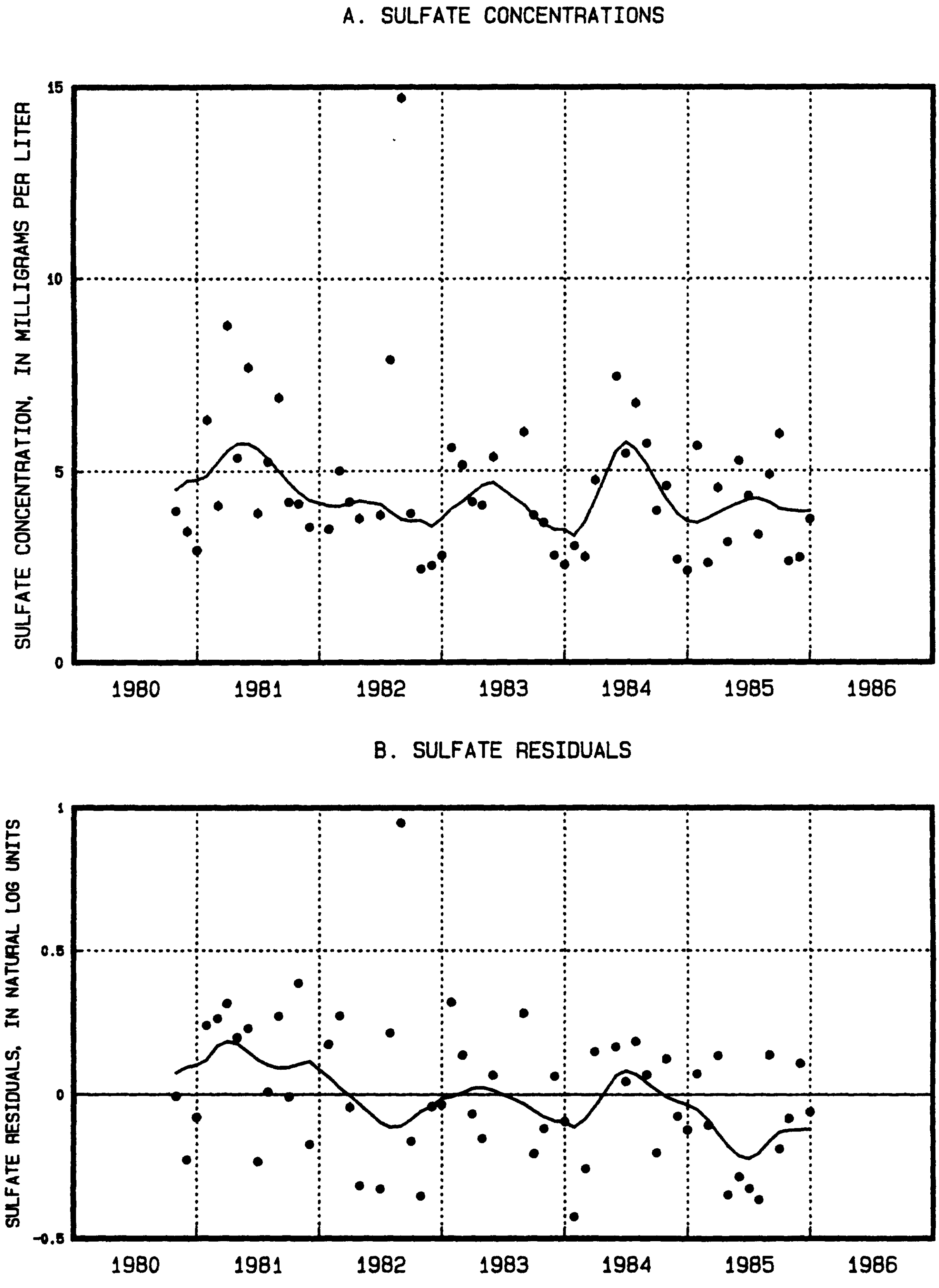


Figure 56.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, Merlin, Ontario, site 177a.

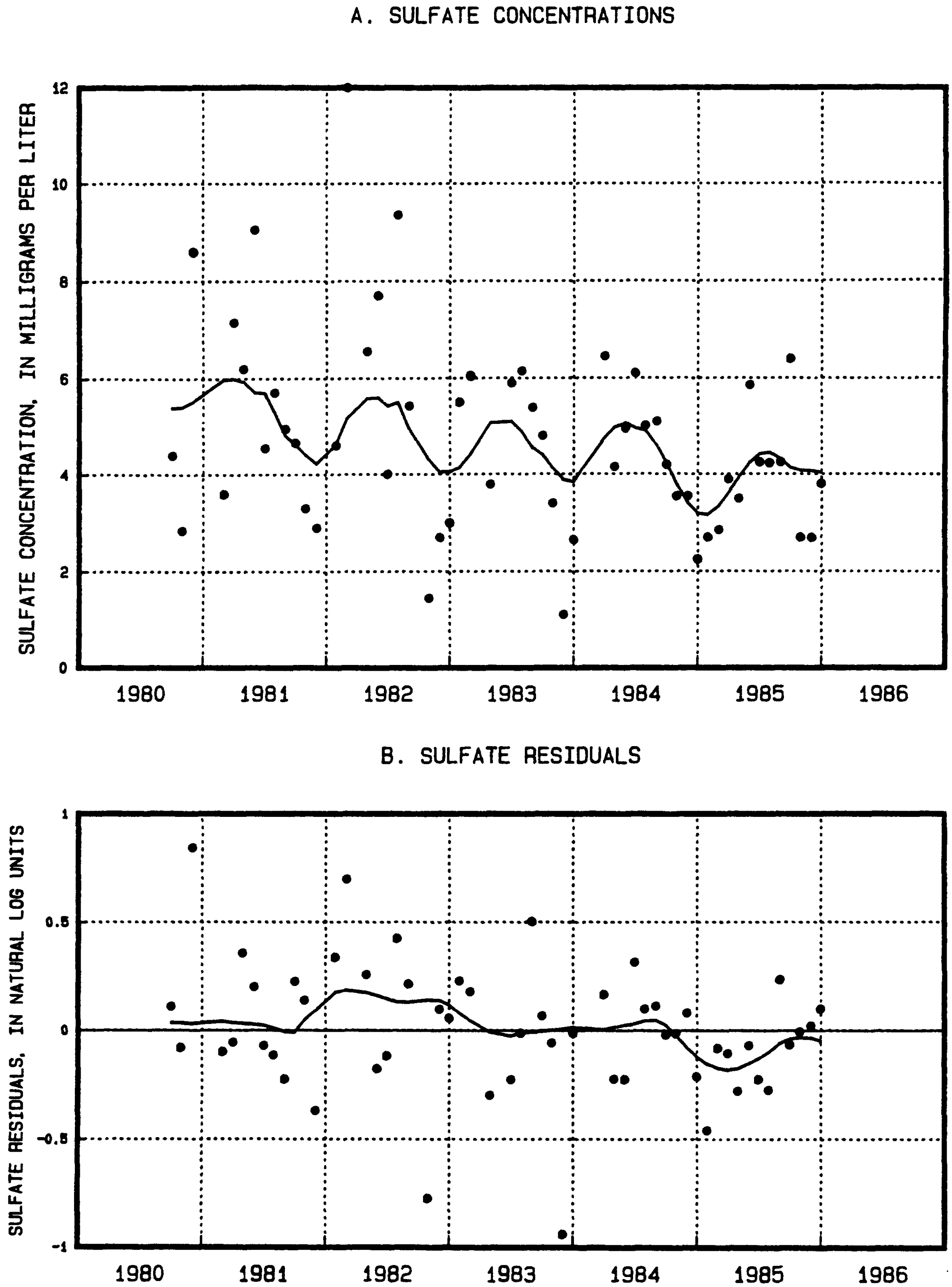
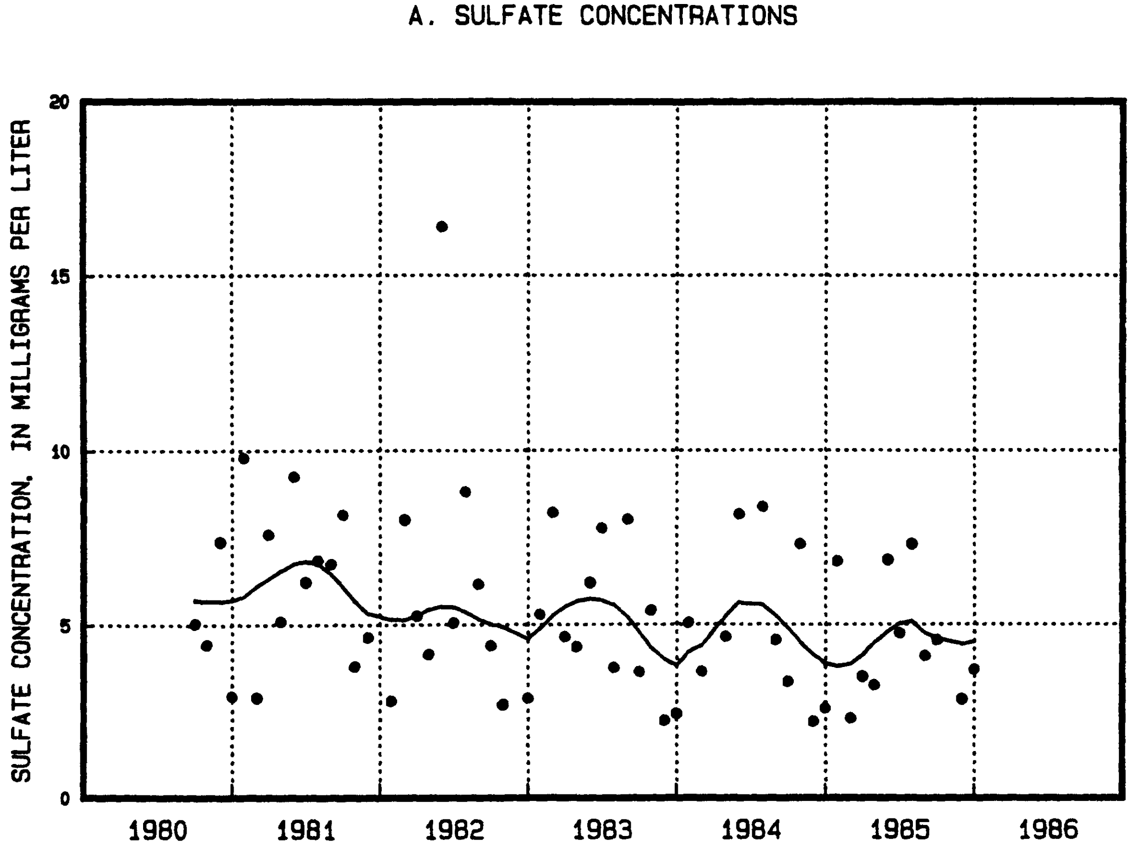


Figure 57.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, Port Stanley, Ontario, site 178a.



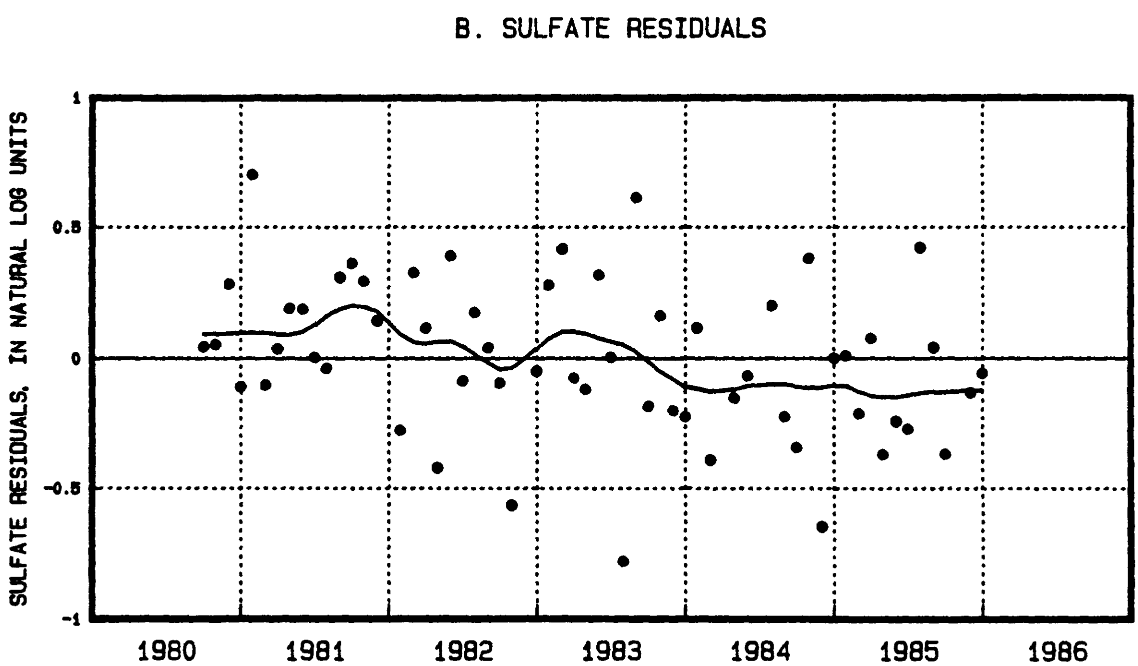


Figure 58.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, Wilkesport, Ontario, site 179a.

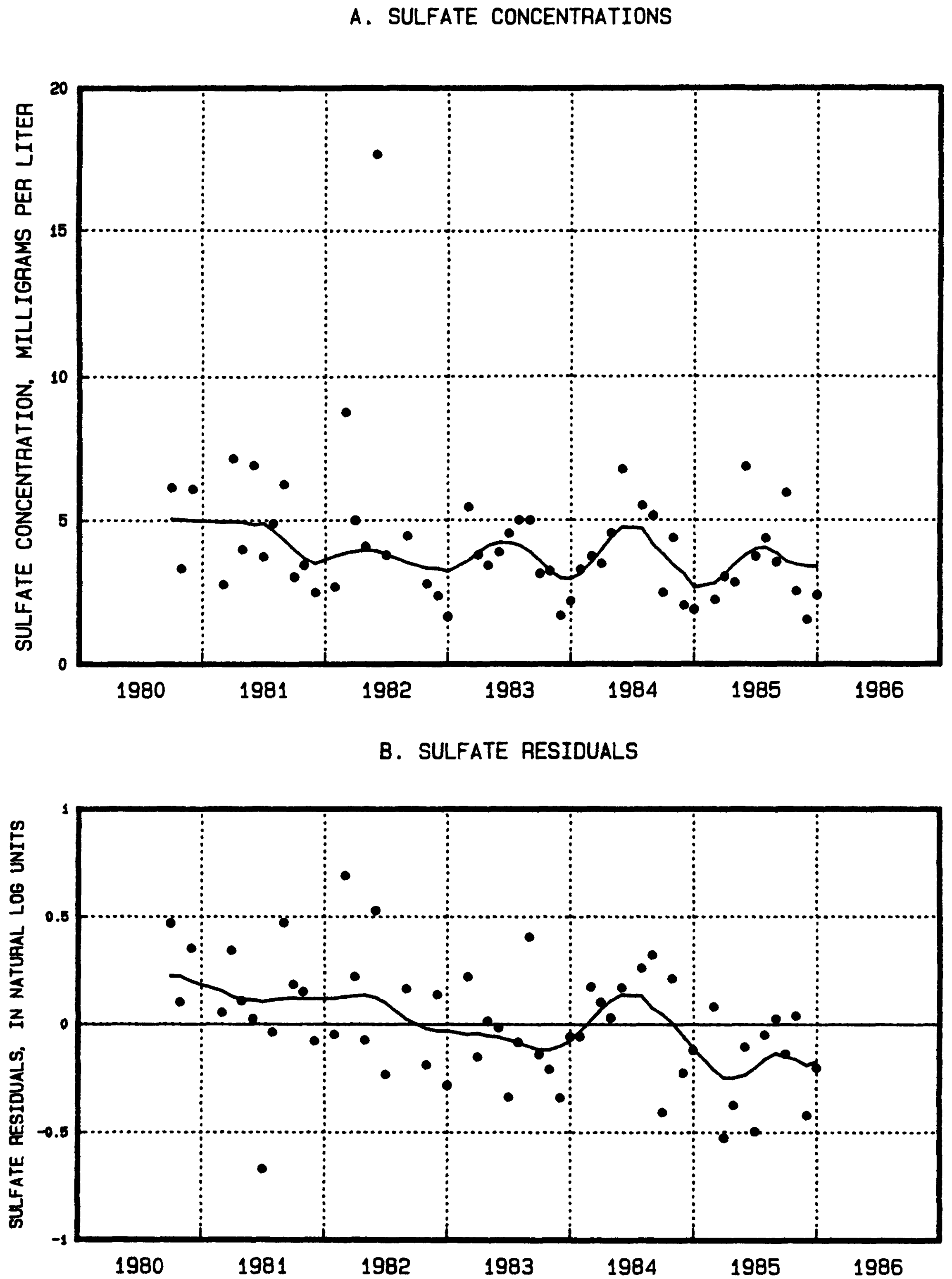
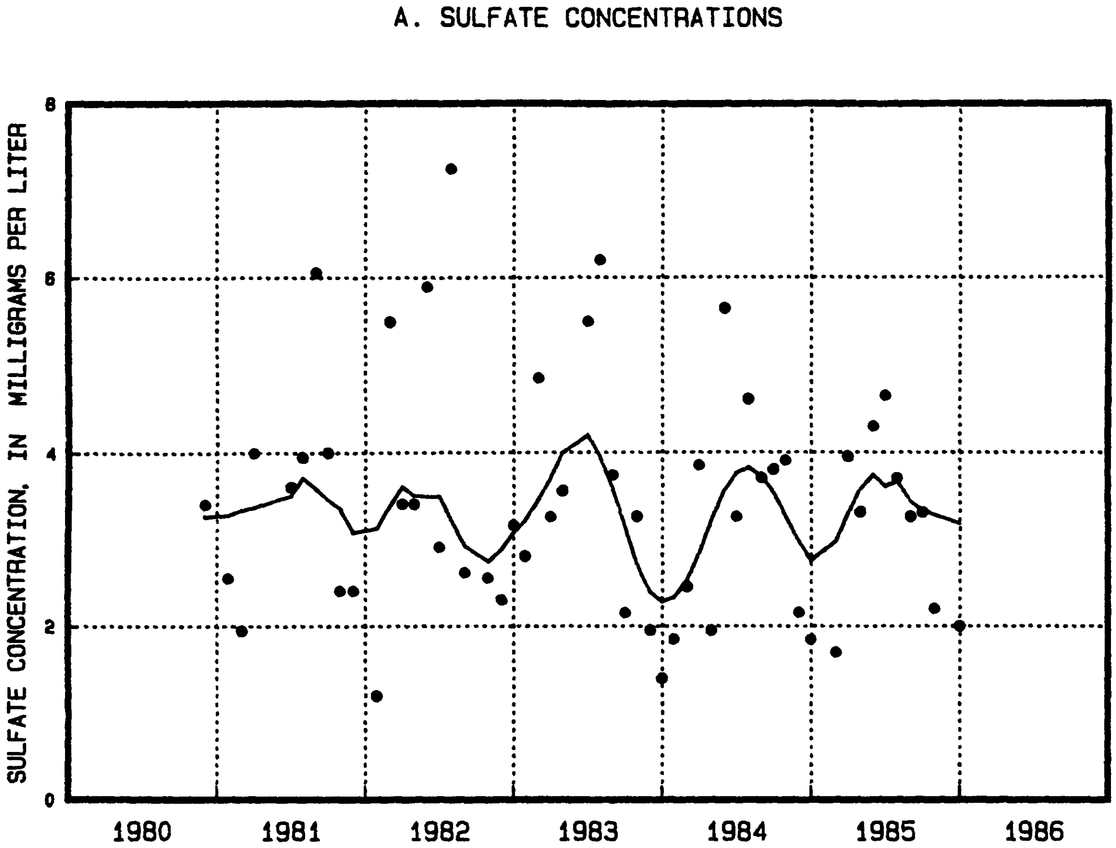


Figure 59.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, Alvinston, Ontario, site 180a.



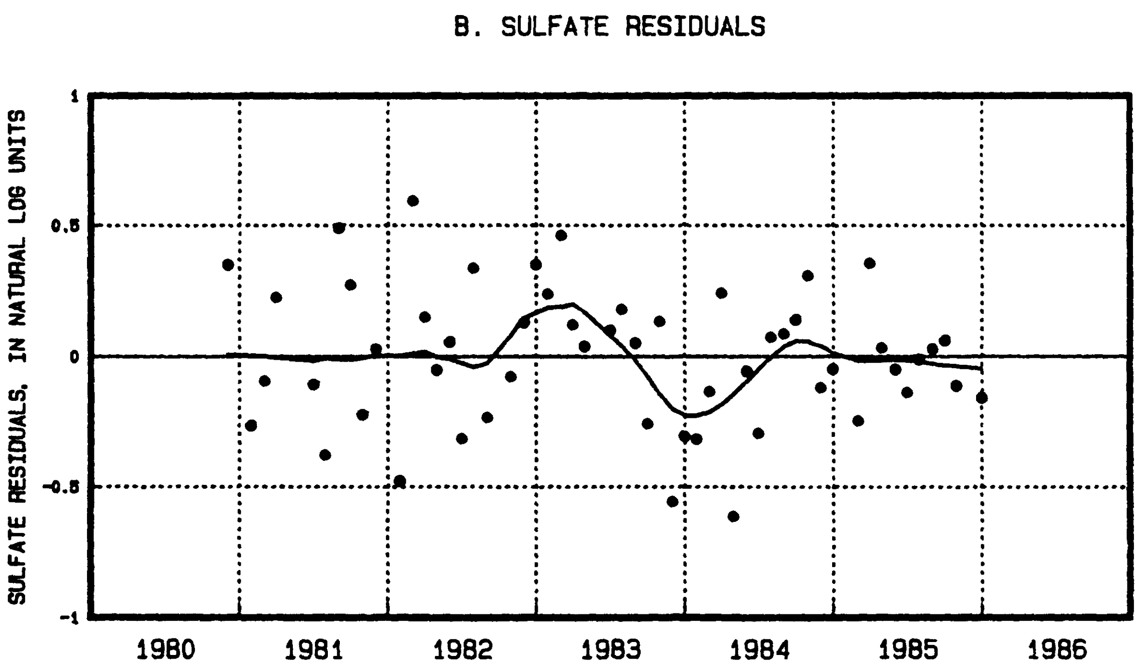
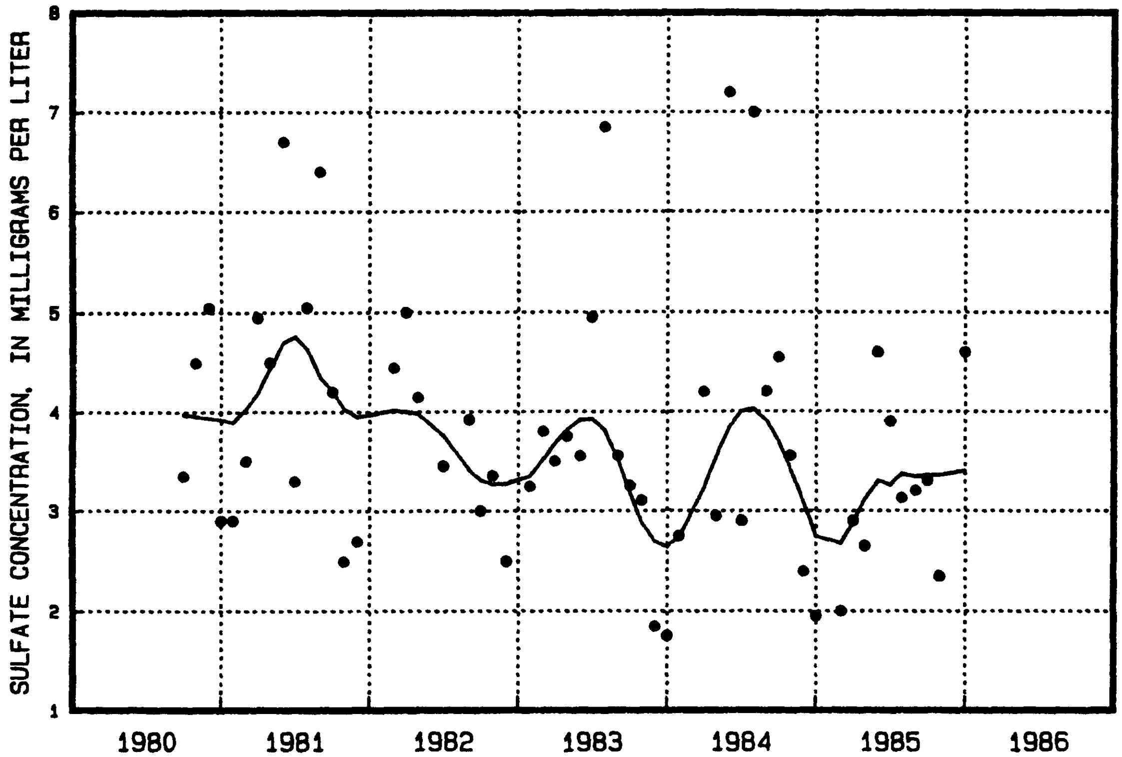


Figure 60.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, Shallow Lake, Ontario, site 181a.

A. SULFATE CONCENTRATIONS



B. SULFATE RESIDUALS

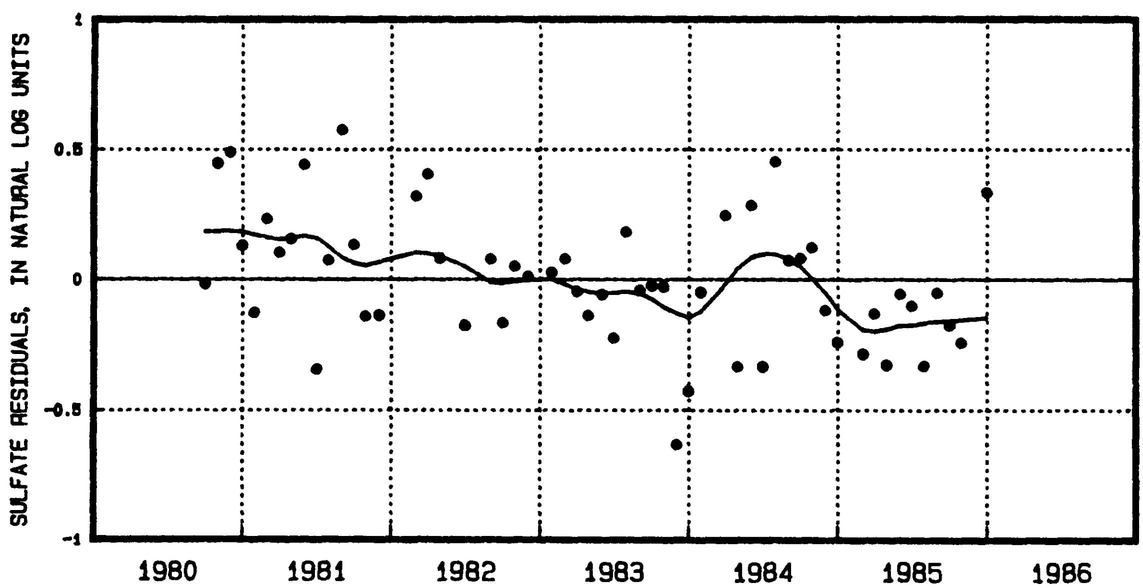


Figure 61.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, Palmerston, Ontario, site 182a.

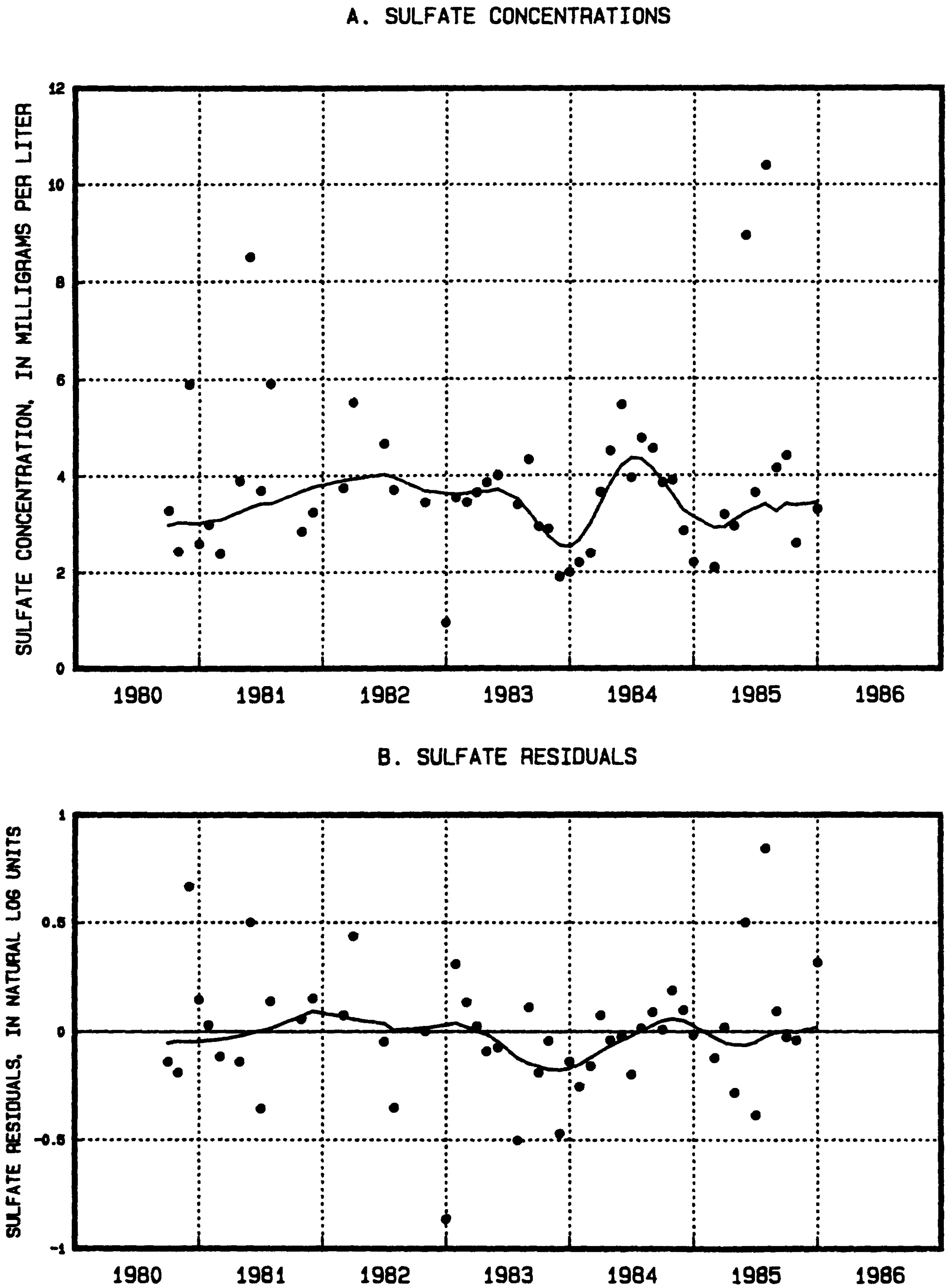
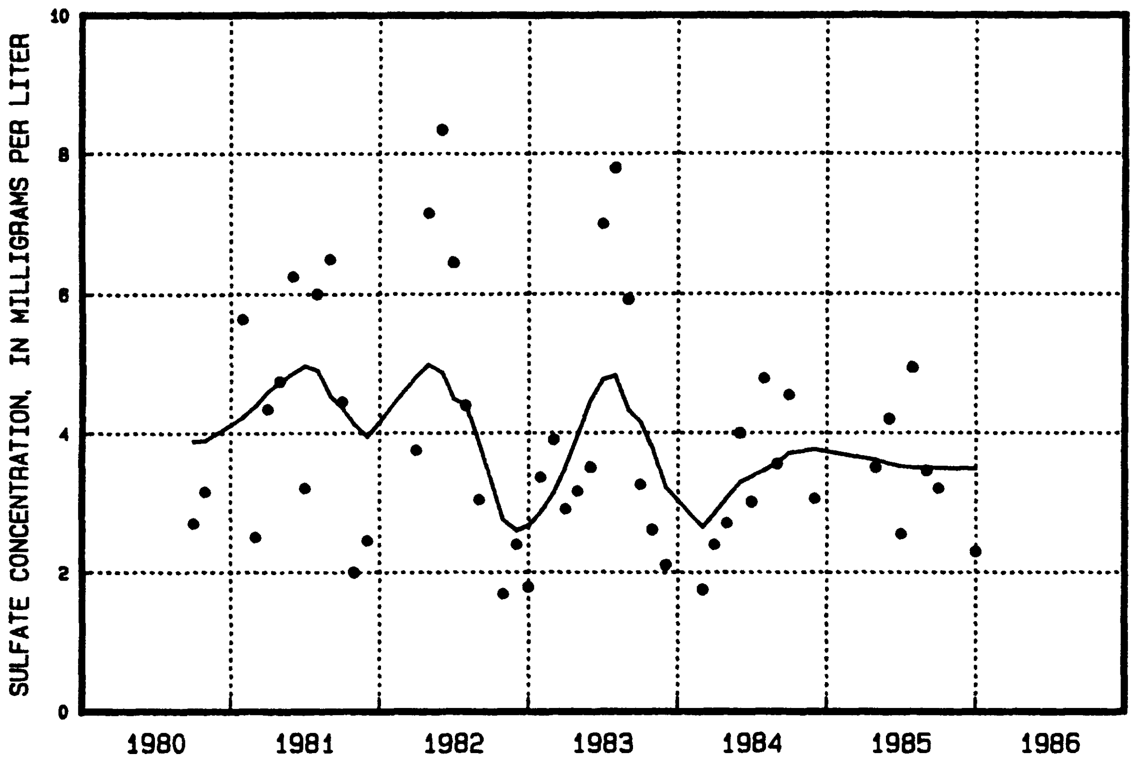


Figure 62.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, Waterloo, Ontario, site 184a.

A. SULFATE CONCENTRATIONS



B. SULFATE RESIDUALS

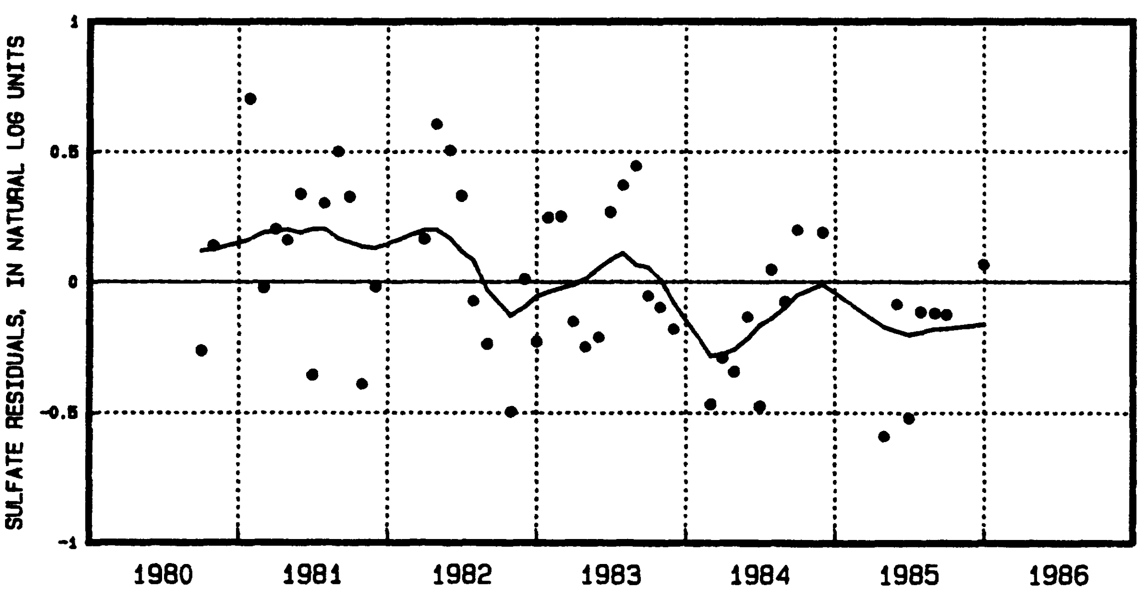
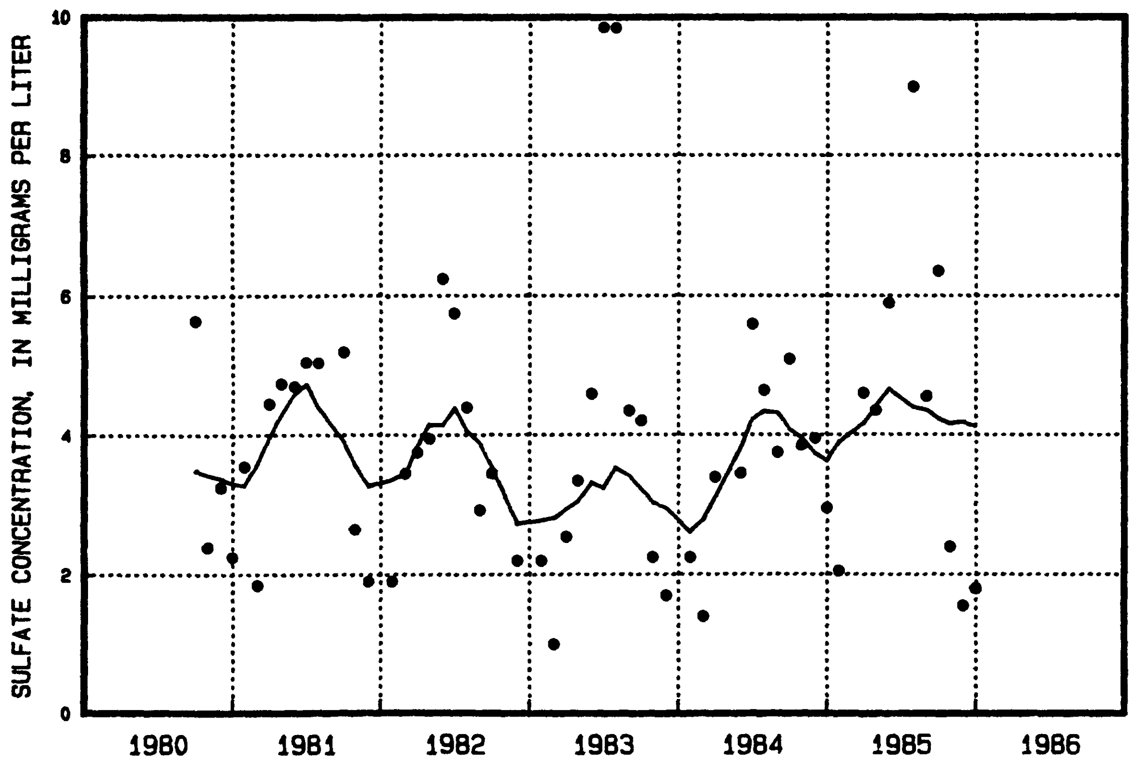


Figure 63.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, Uxbridge, Ontario, site 187a.

A. SULFATE CONCENTRATIONS



B. SULFATE RESIDUALS

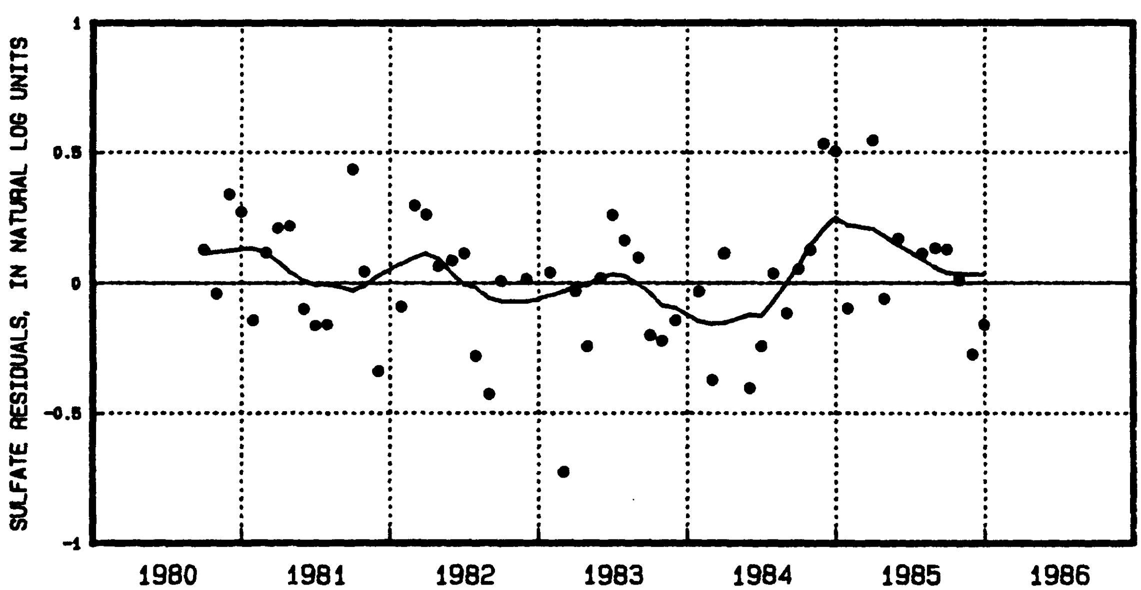


Figure 64.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, Campbellford, Ontario, site 189a.

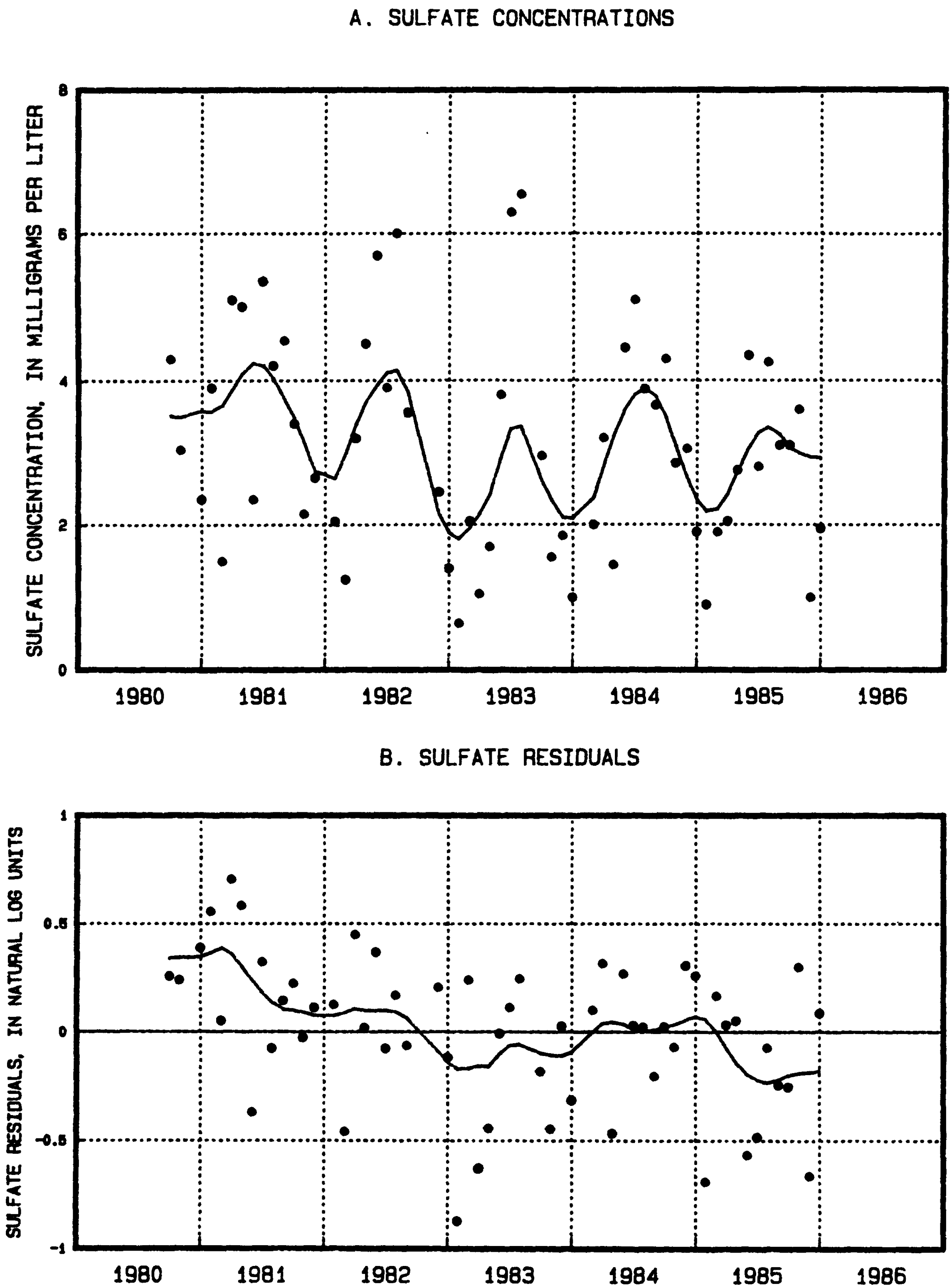


Figure 65.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, Smith's Falls, Ontario, site 192a.

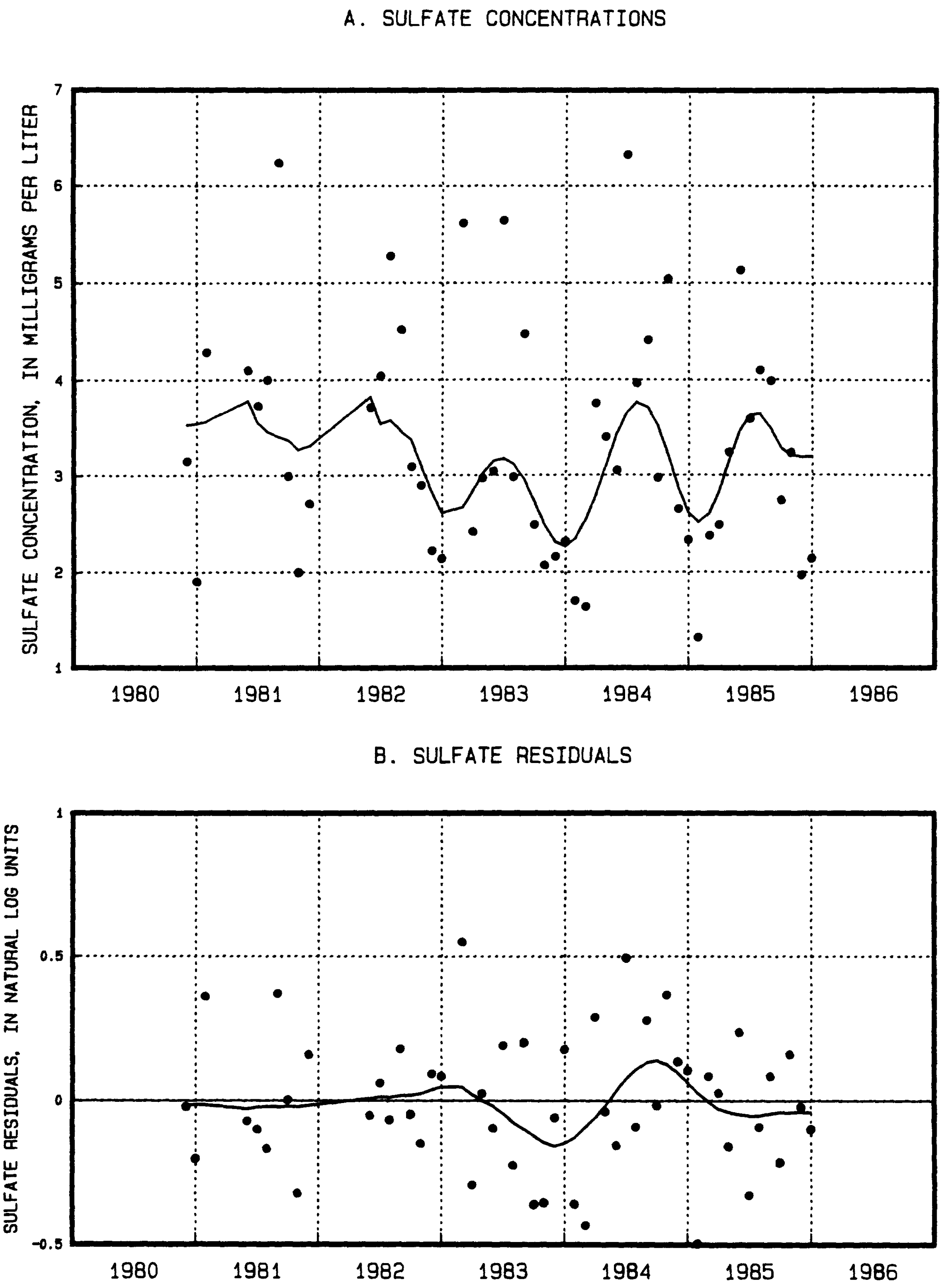


Figure 66.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, Melbourne, Ontario, site 221a.

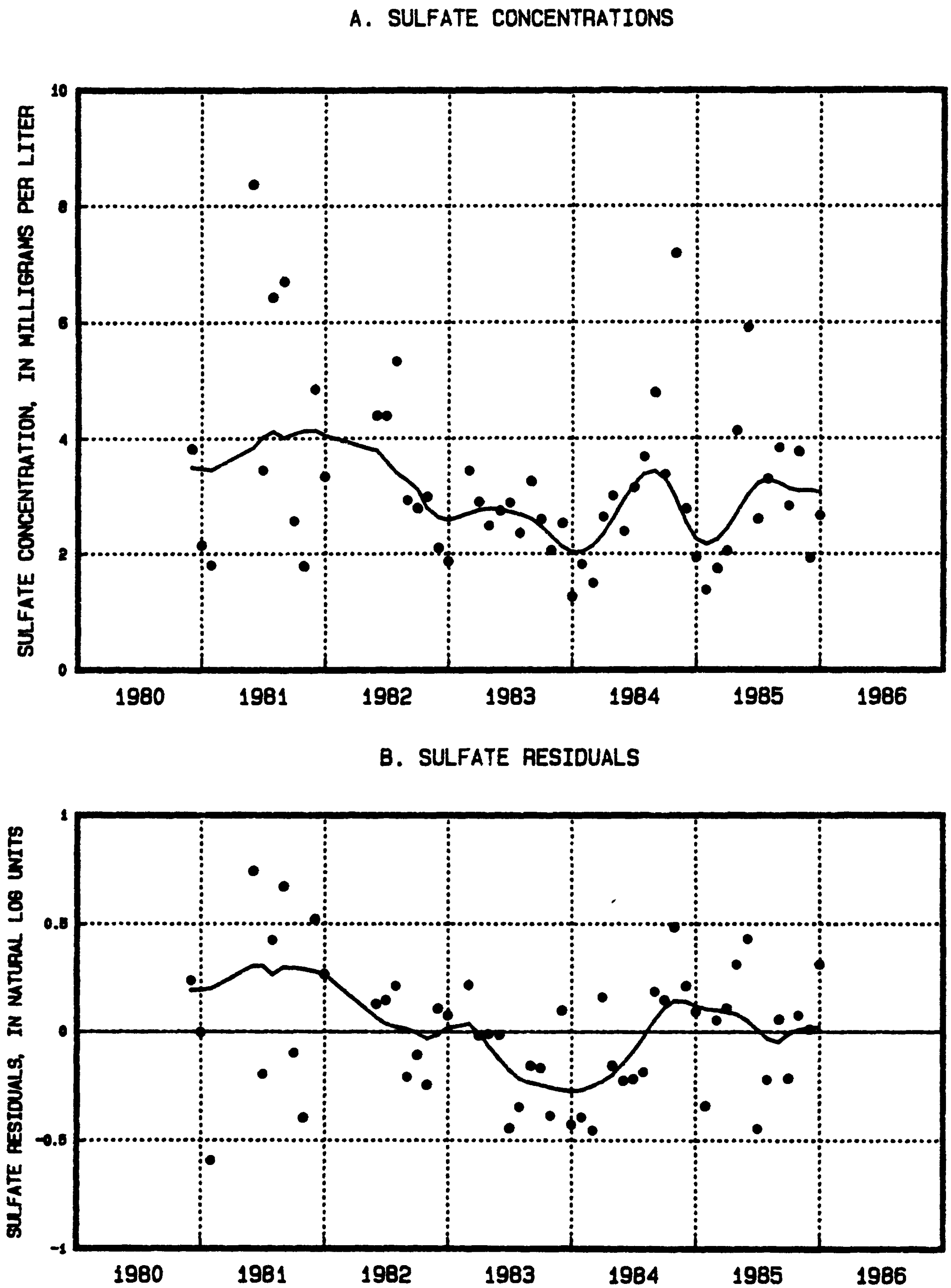


Figure 67.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, North Easthope, Ontario, site 222a.

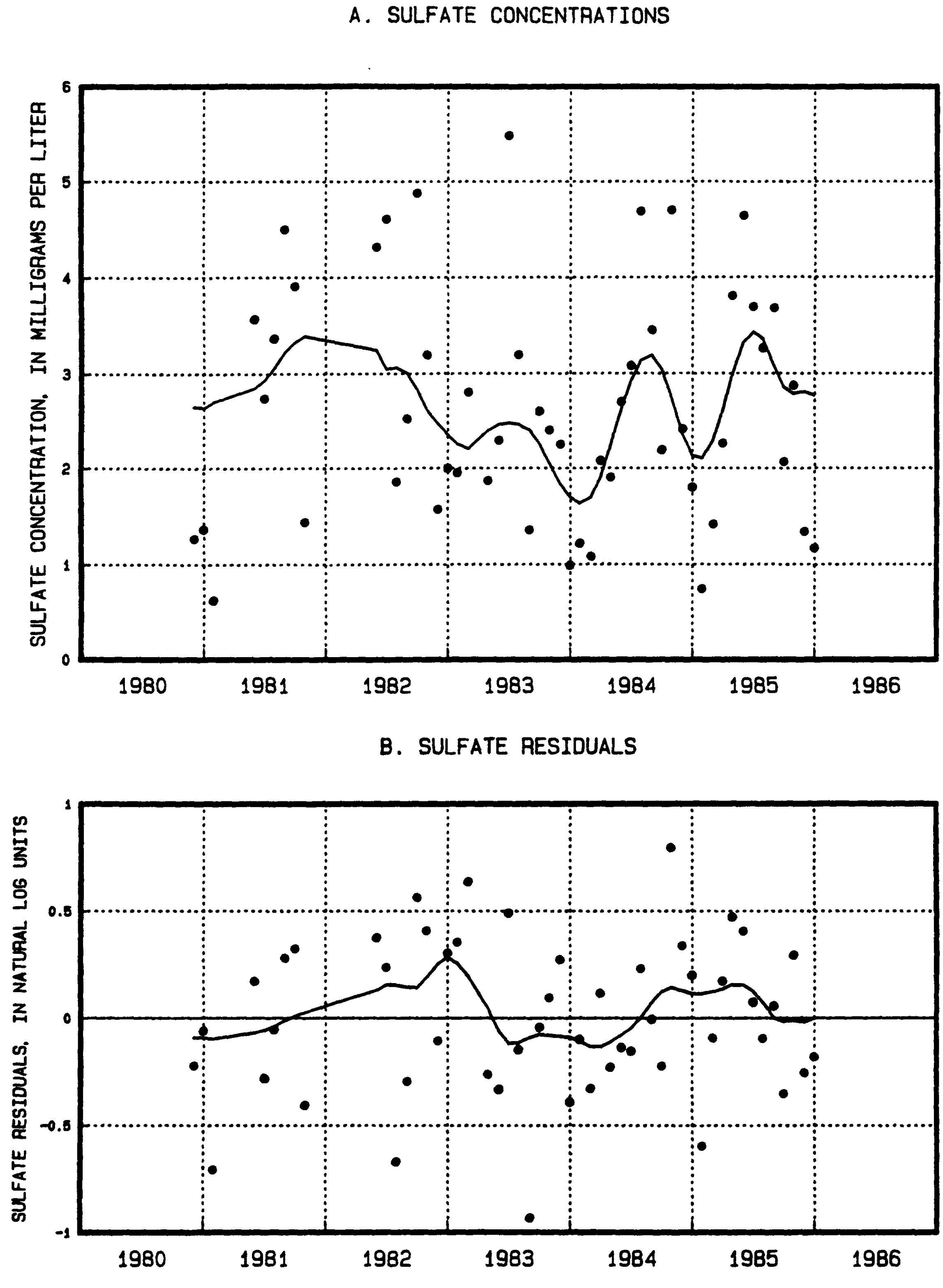


Figure 68.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, Balsam Lake, Ontario, site 225a.

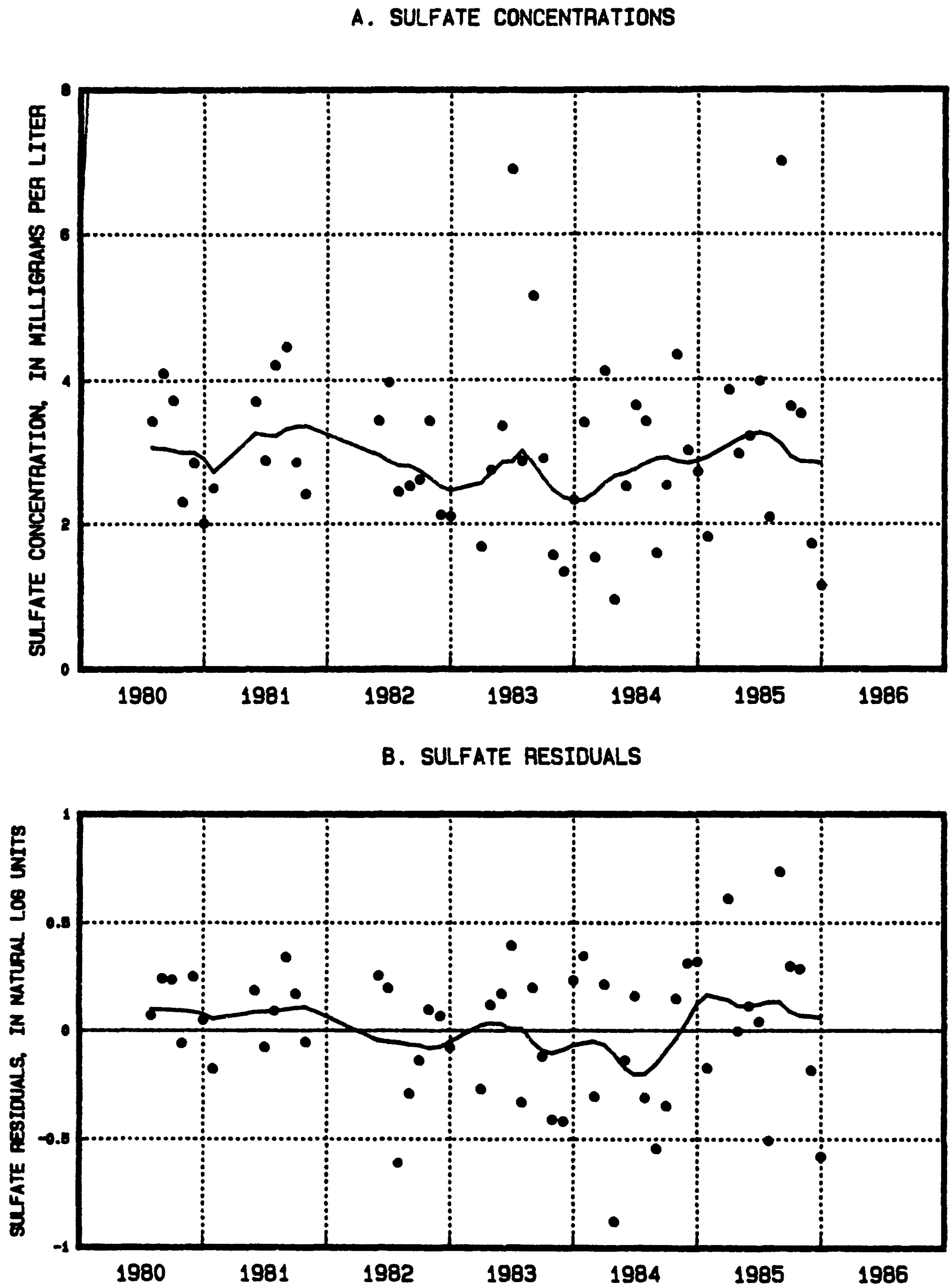
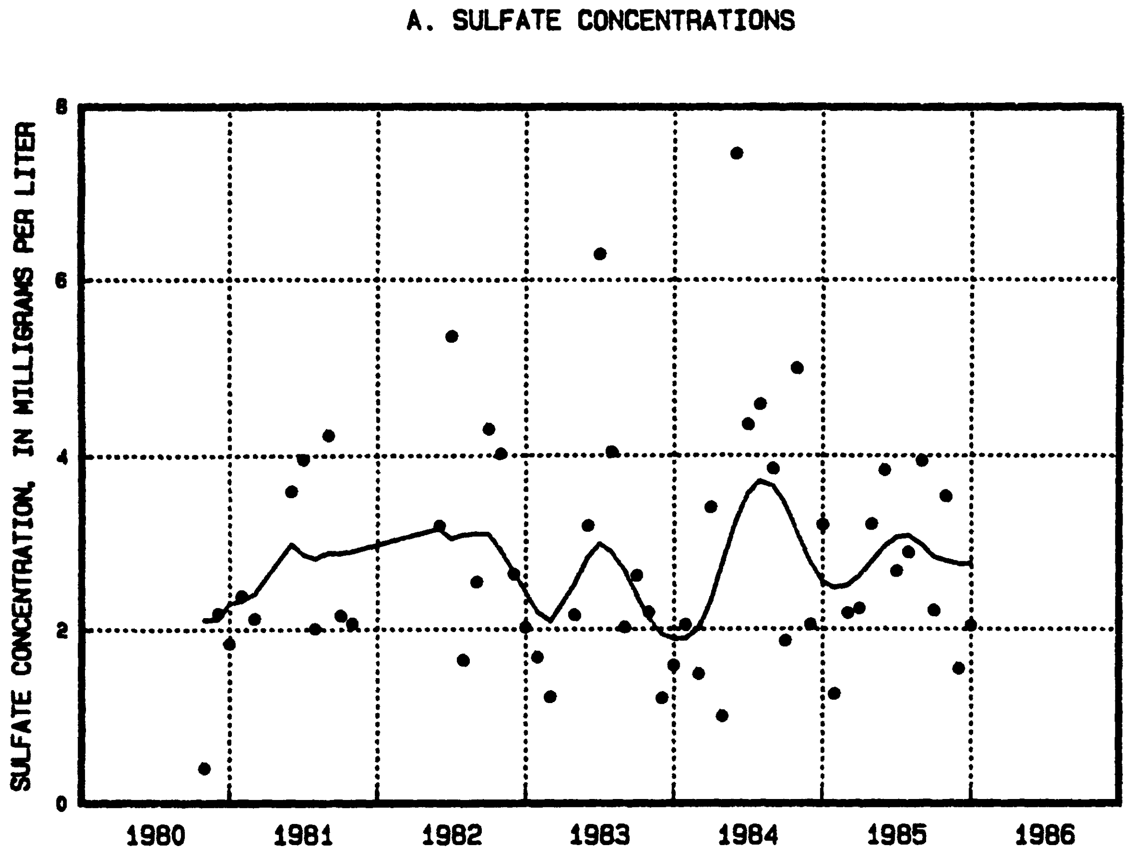


Figure 69.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, Railton, Ontario, site 228a.



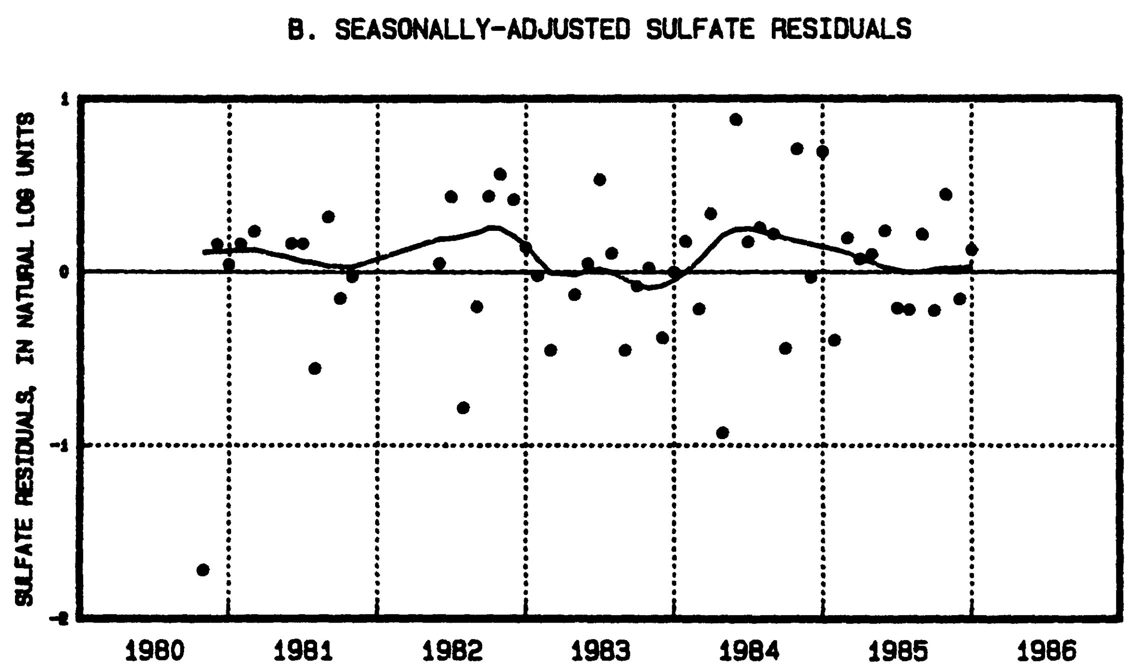
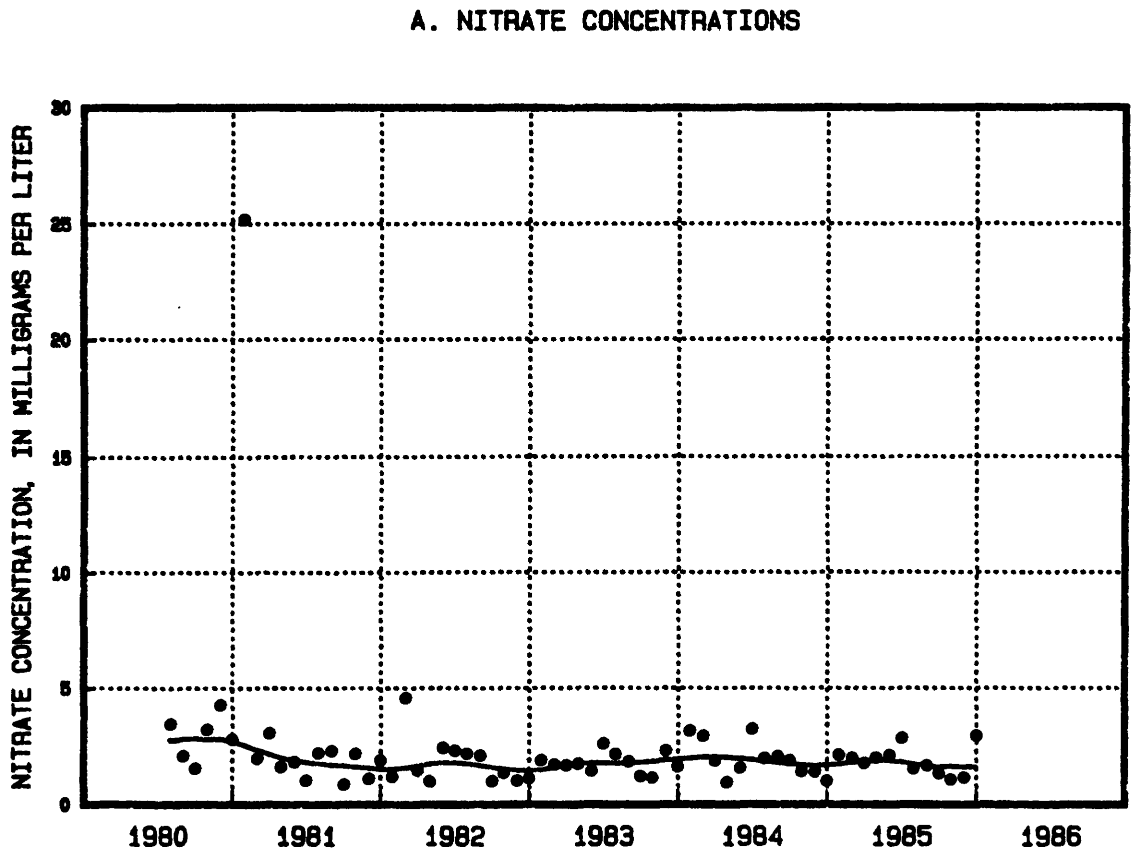


Figure 70.--Smoothed (A) sulfate concentrations and (B) sulfate residuals adjusted for season and amount of precipitation, Graham Lake, Ontario, site 229a.



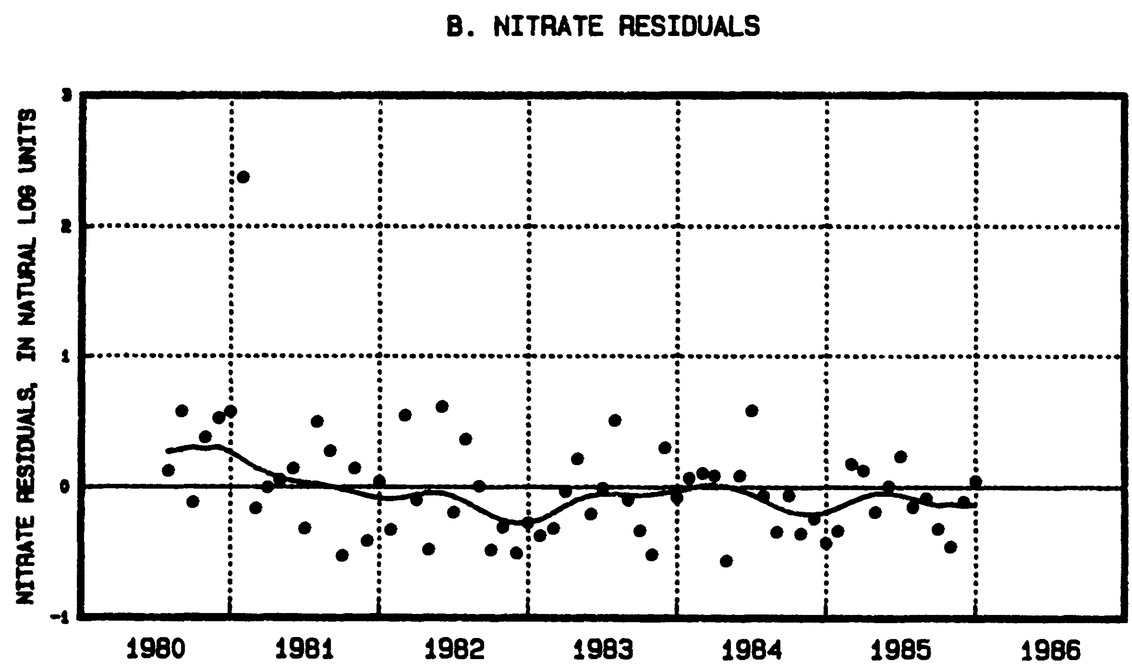


Figure 71.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for amount of precipitation, Indiana Dunes, Indiana, site 025a.

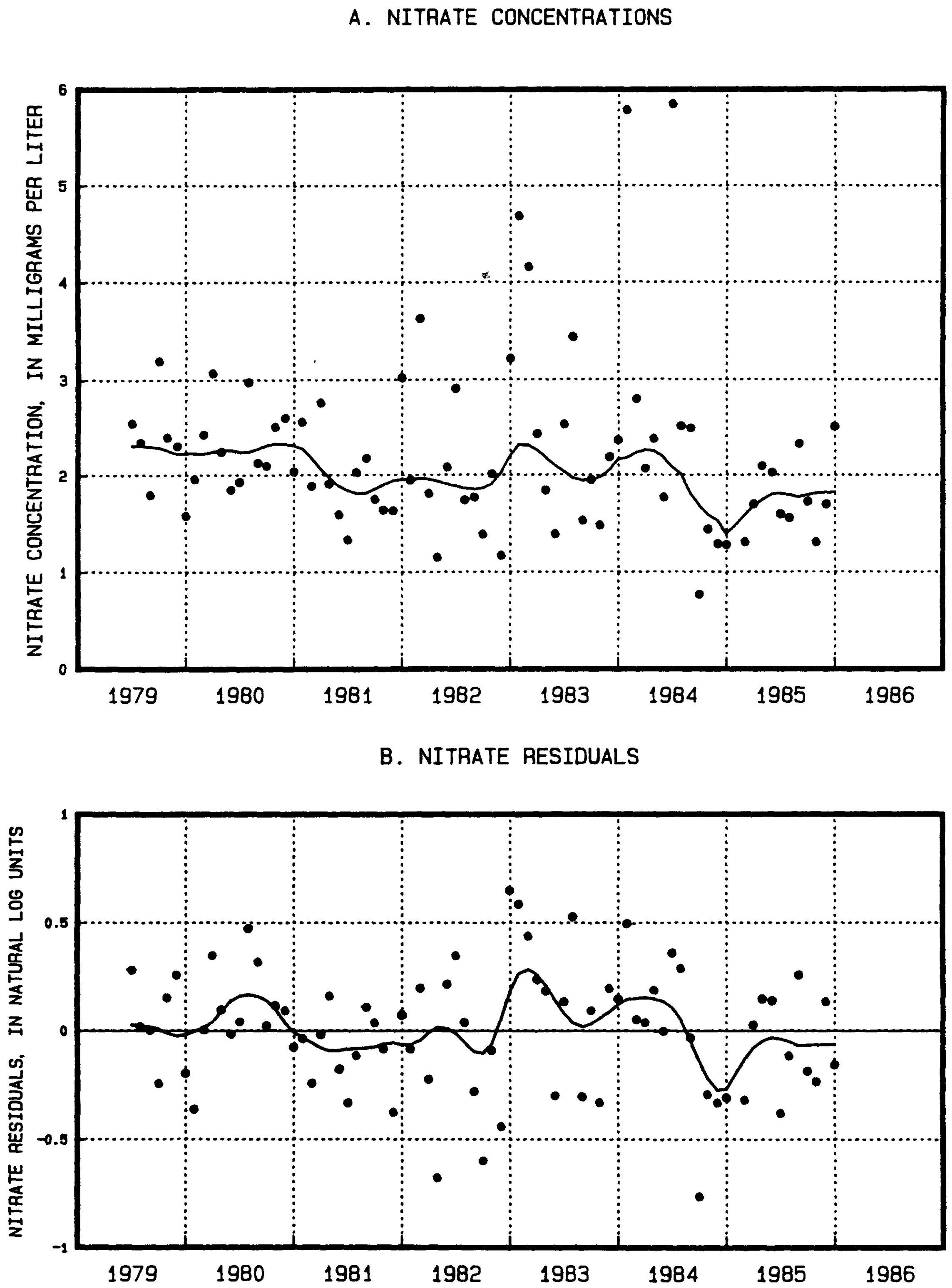
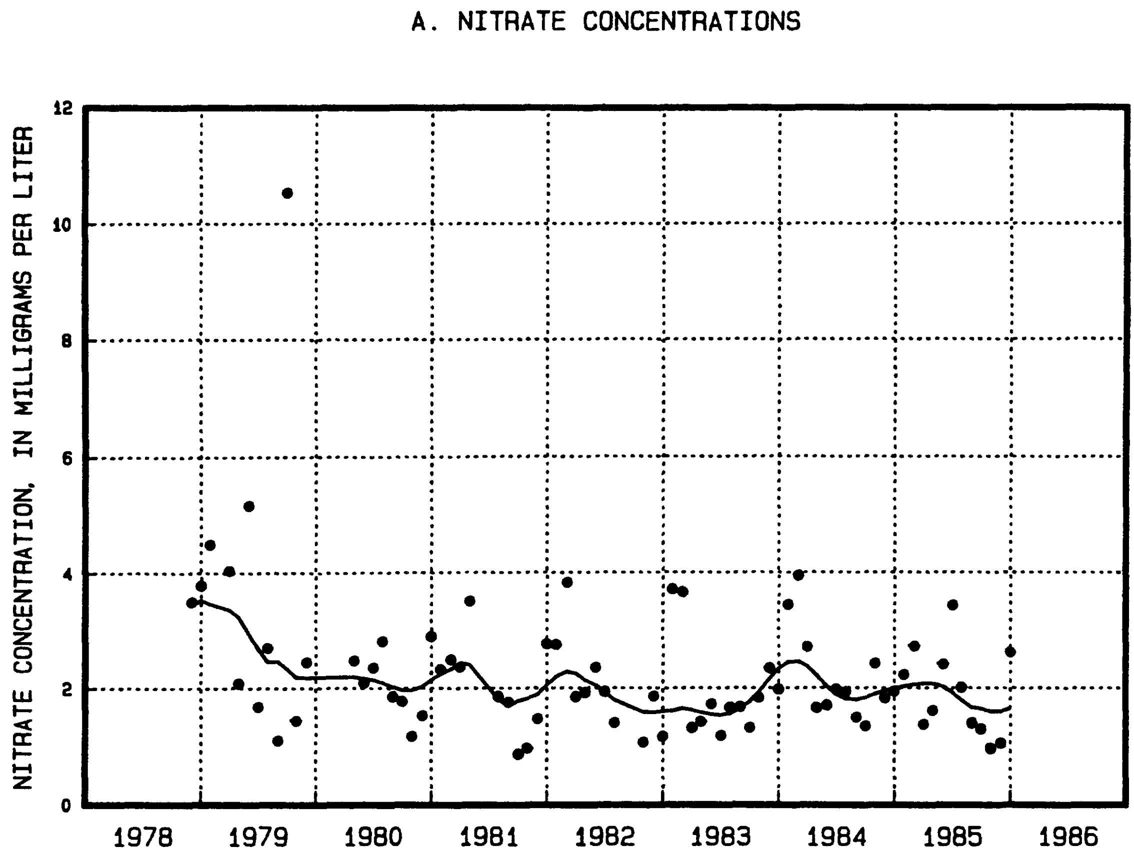


Figure 72.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for amount of precipitation, Kellogg, Michigan, site 032a.



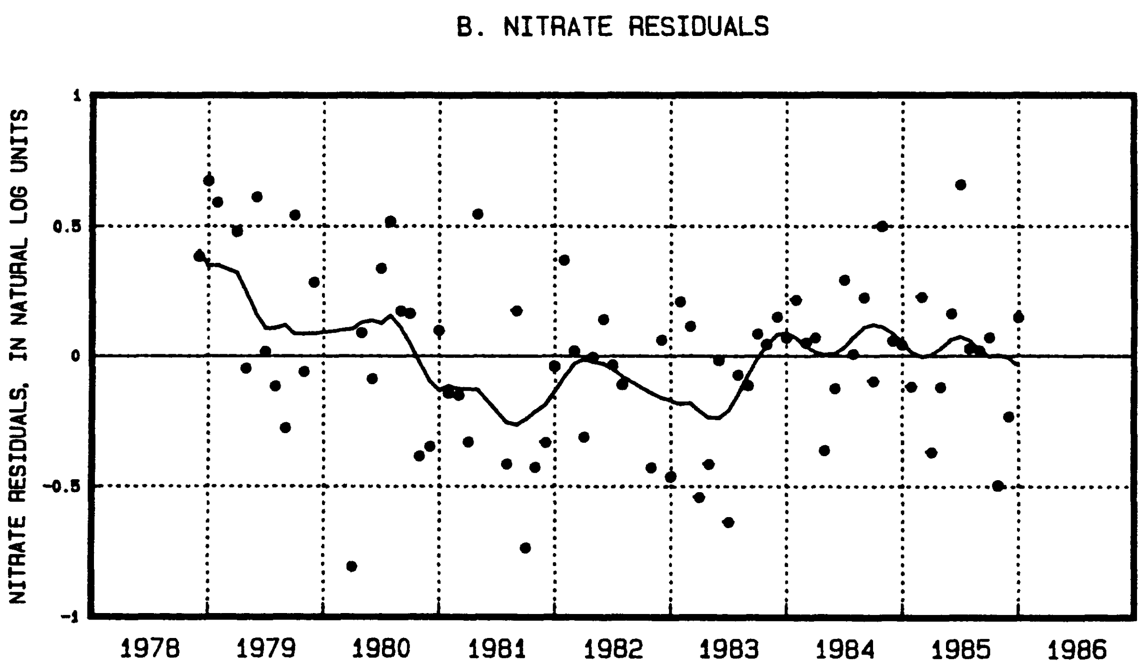


Figure 73.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for amount of precipitation, Wellston, Michigan, site 033a.

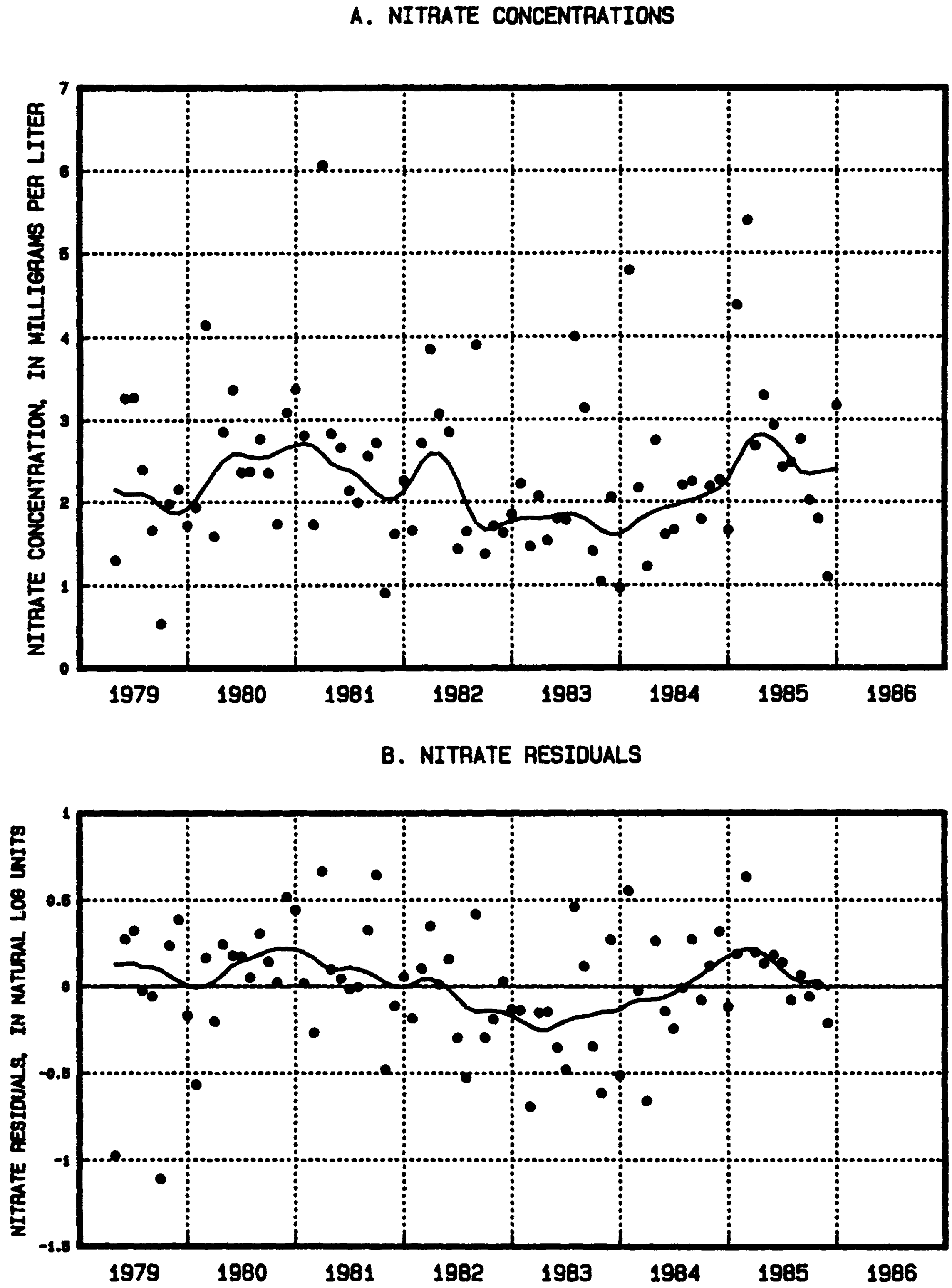


Figure 74.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for amount of precipitation, Aurora, New York, site 040a.

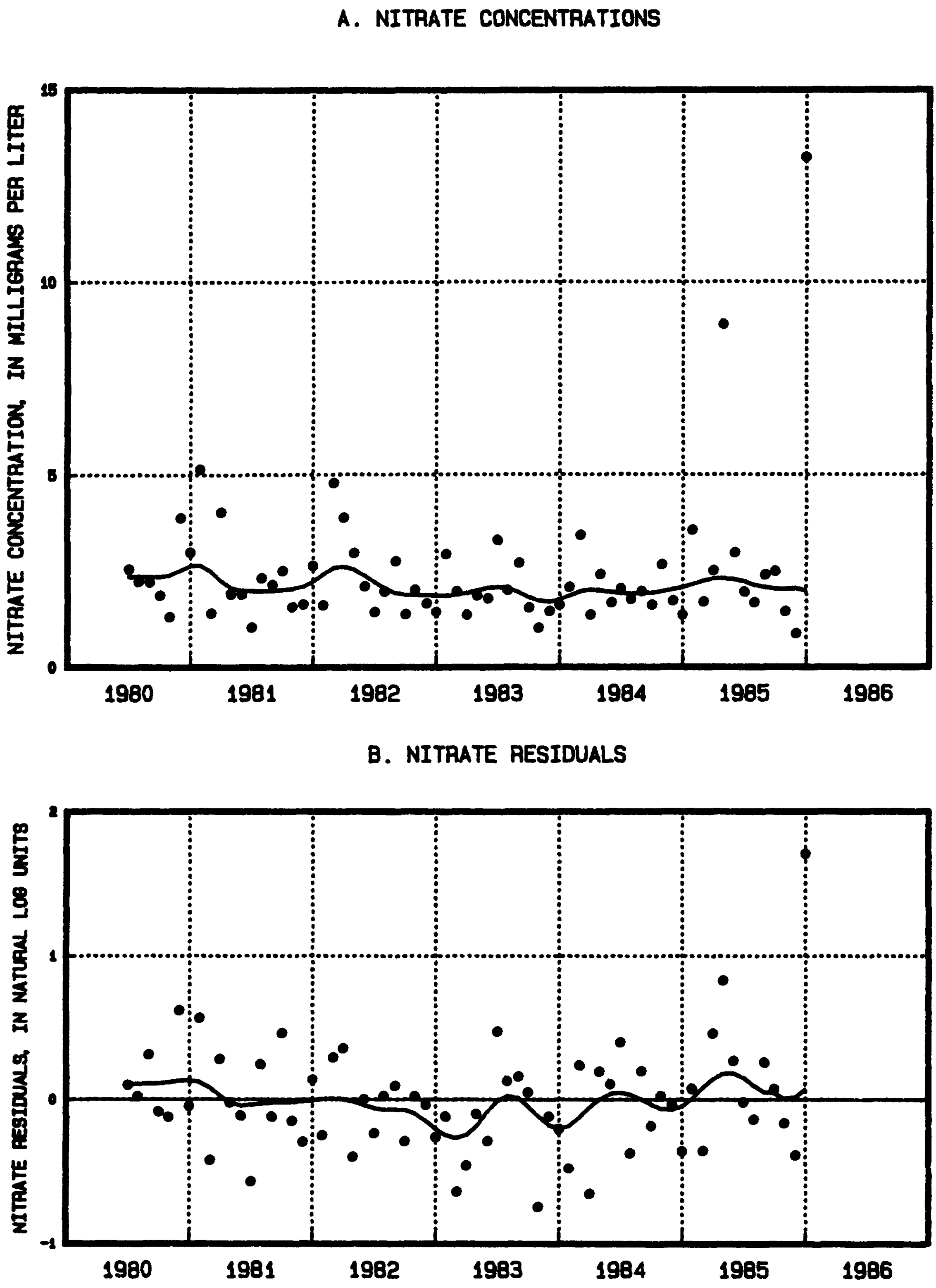


Figure 75.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for amount of precipitation, Chautauqua, New York, site 041a.

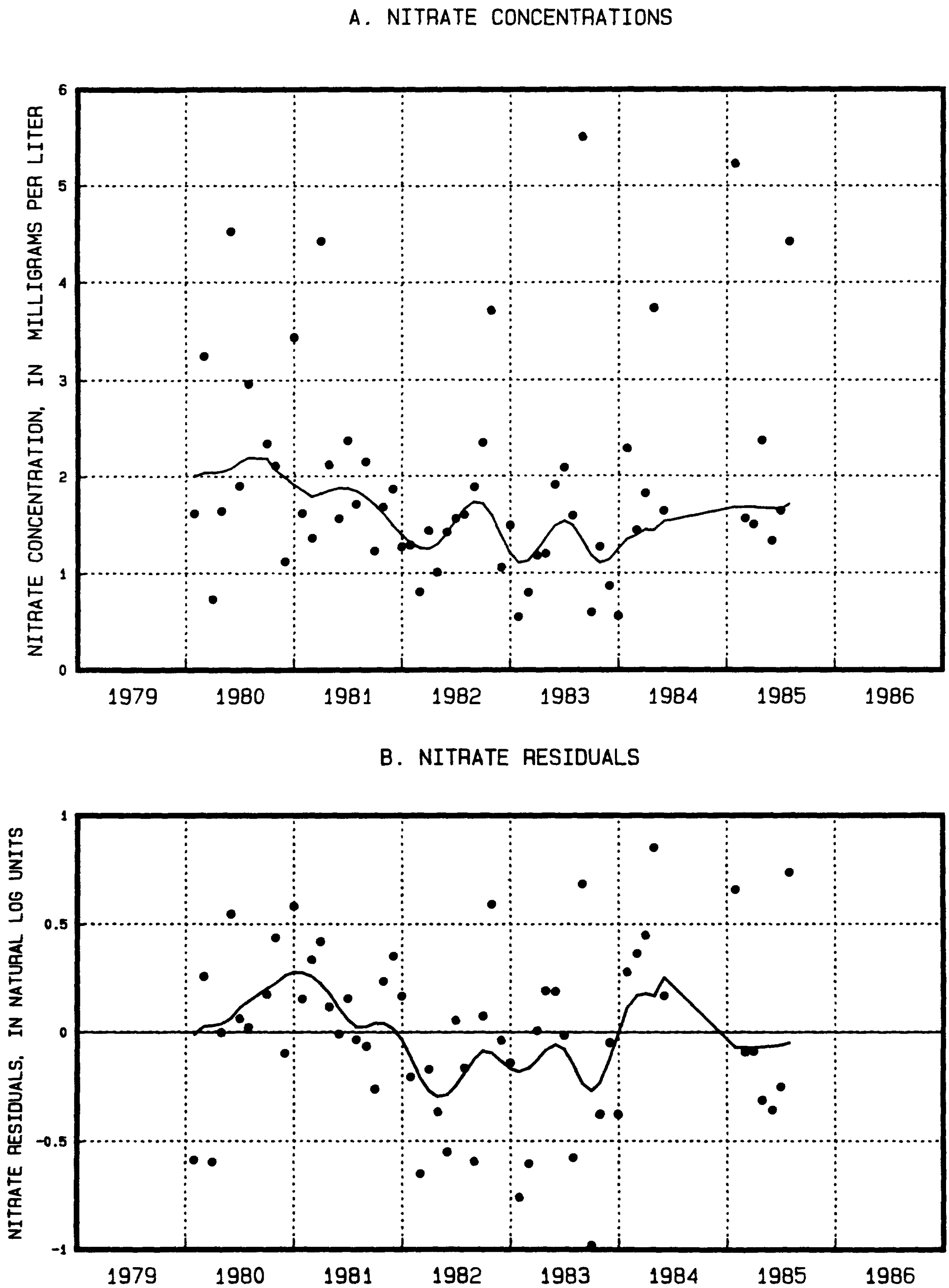
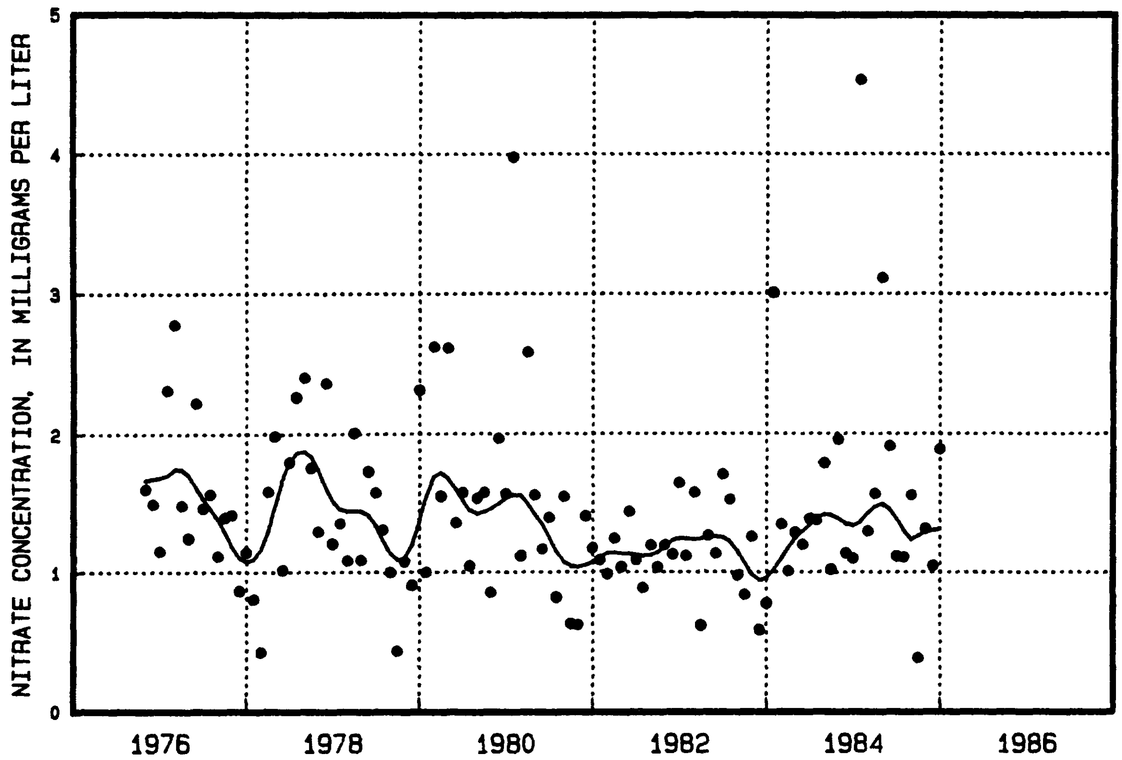


Figure 76.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for season and amount of precipitation, Knobit, New York, site 042a.

A. NITRATE CONCENTRATIONS



B. NITRATE RESIDUALS

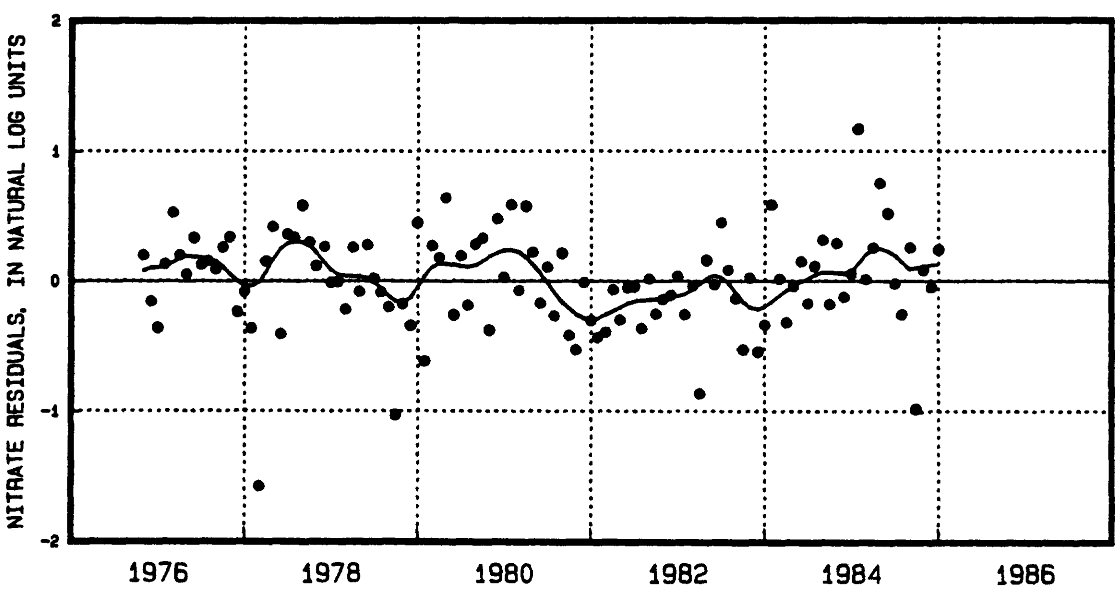
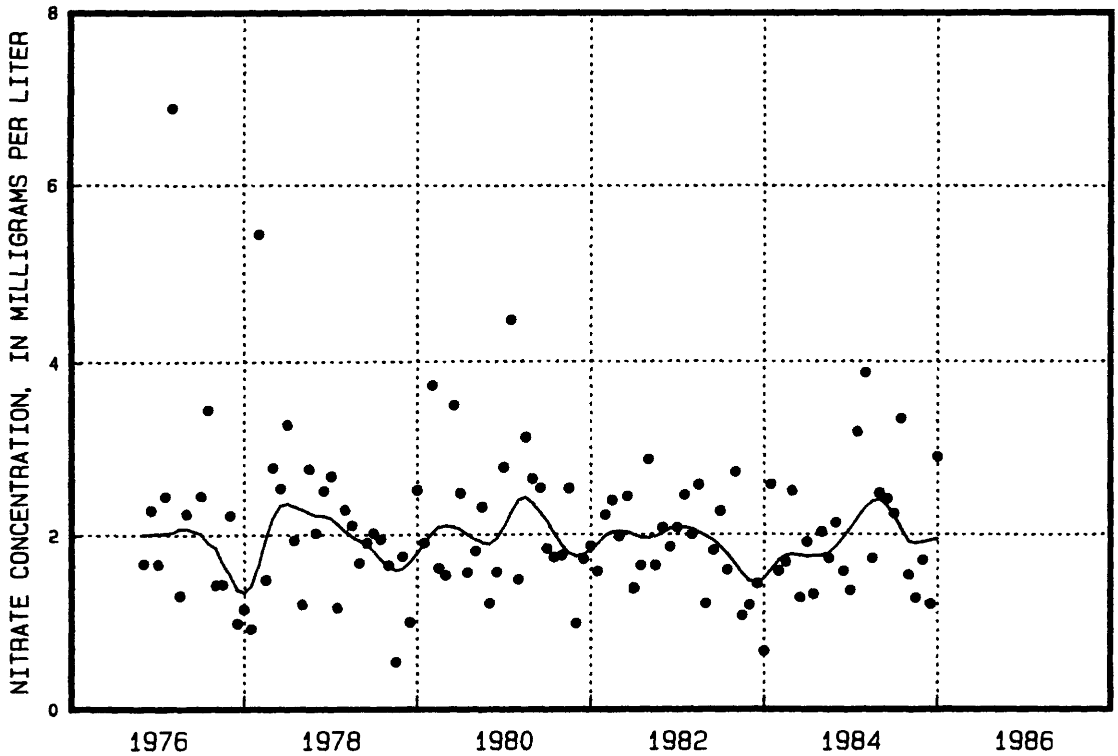


Figure 77.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for amount of precipitation, Whiteface, New York, site 043a.

A. NITRATE CONCENTRATIONS



B. NITRATE RESIDUALS

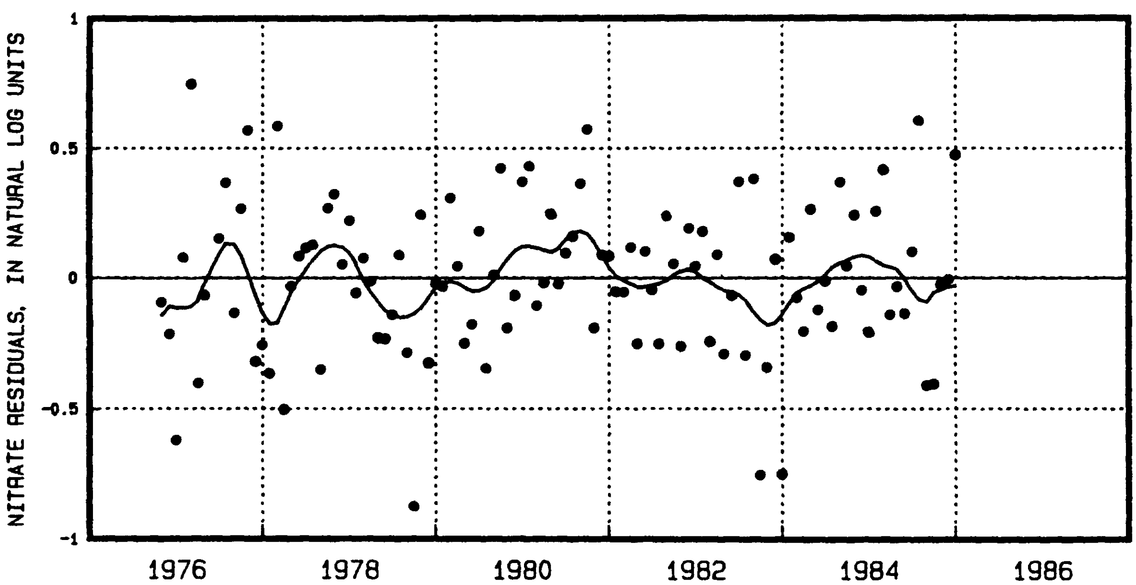


Figure 78.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for seasn and amount of precipitation, Ithaca, New York, site 044a.

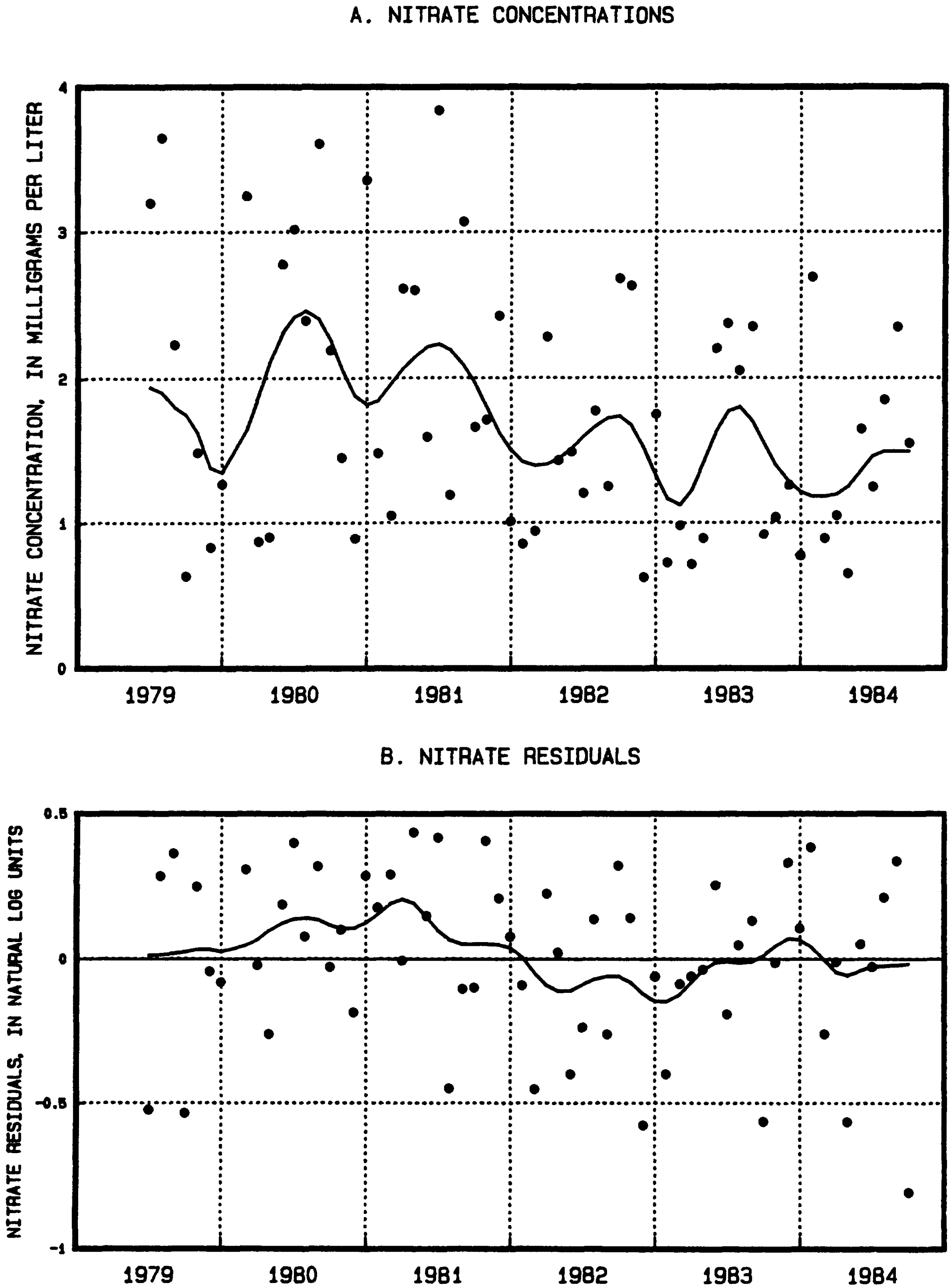


Figure 79.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for season and amount of precipitation, Stillwell Lake, New York, site 045a.

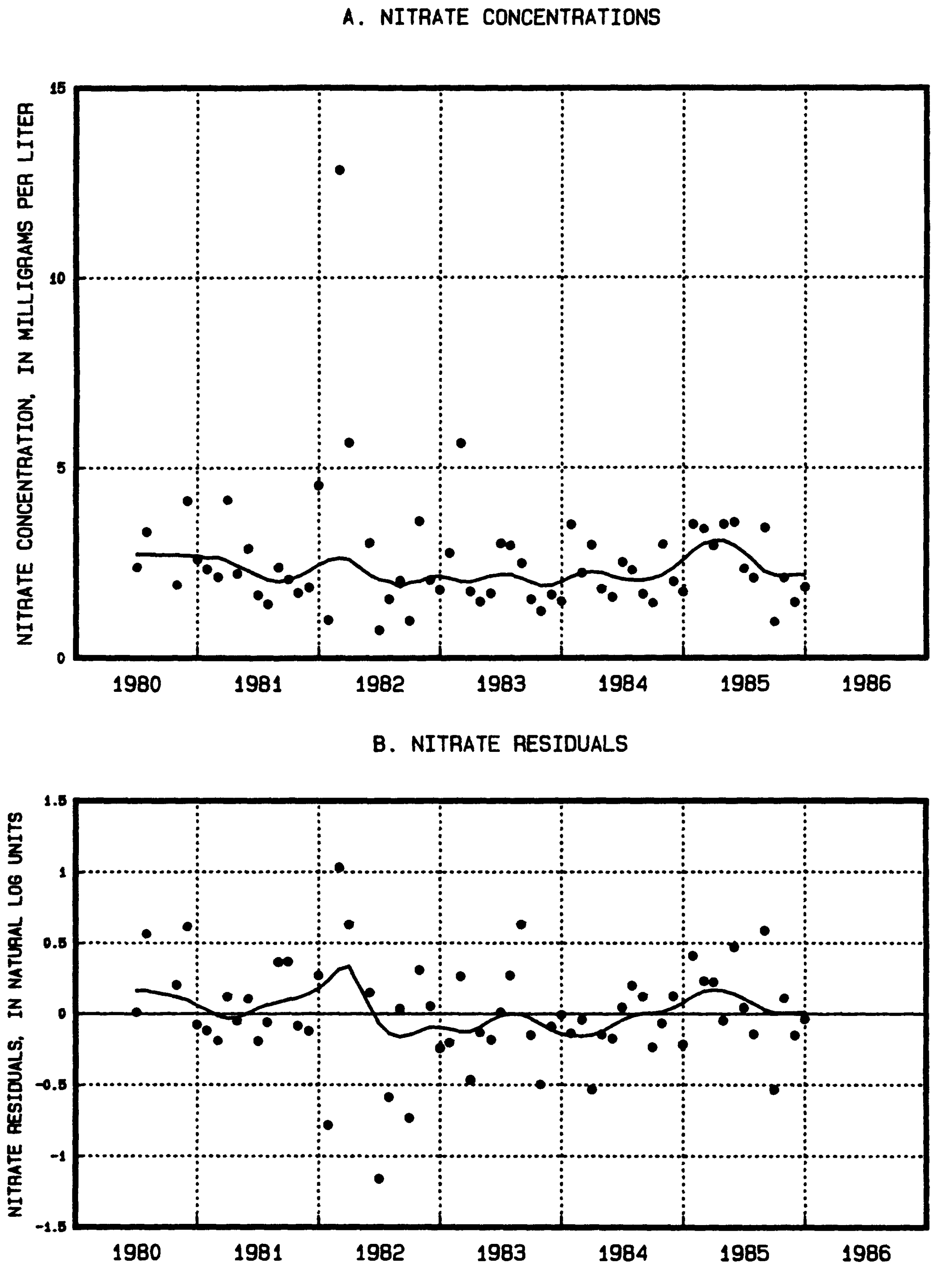
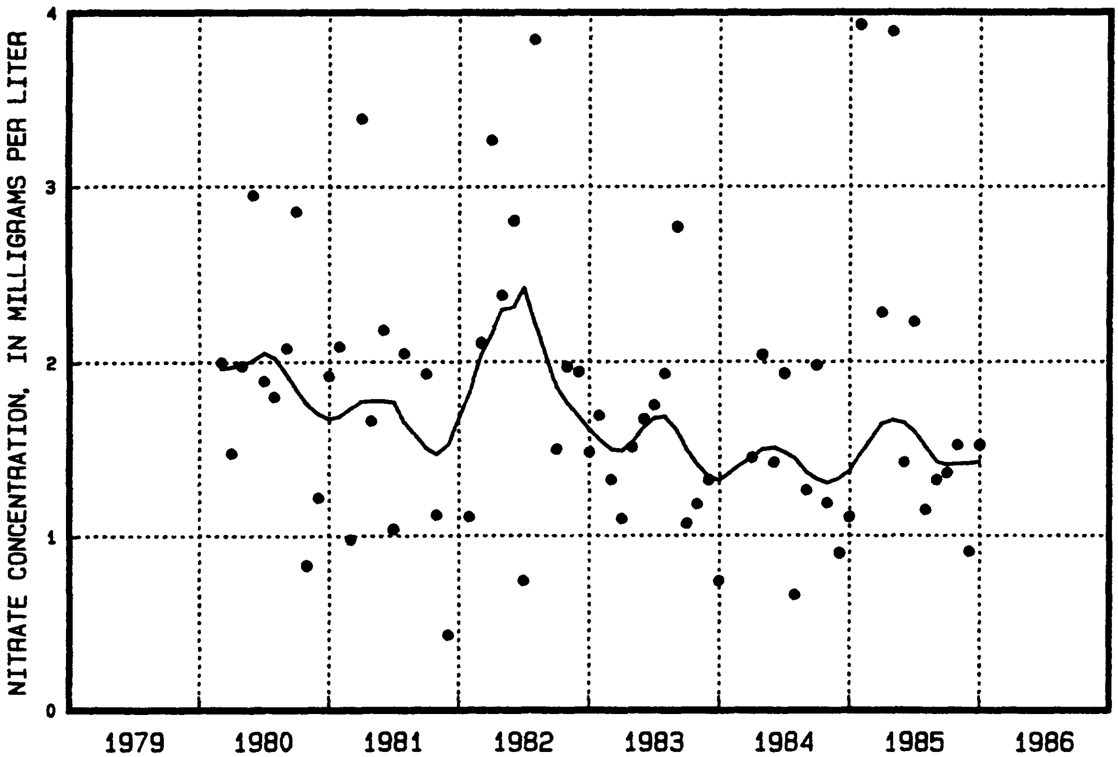


Figure 80.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for season and amount of precipitation, Bennett Ridge, New York, site 046a.

A. NITRATE CONCENTRATIONS



B. NITRATE RESIDUALS

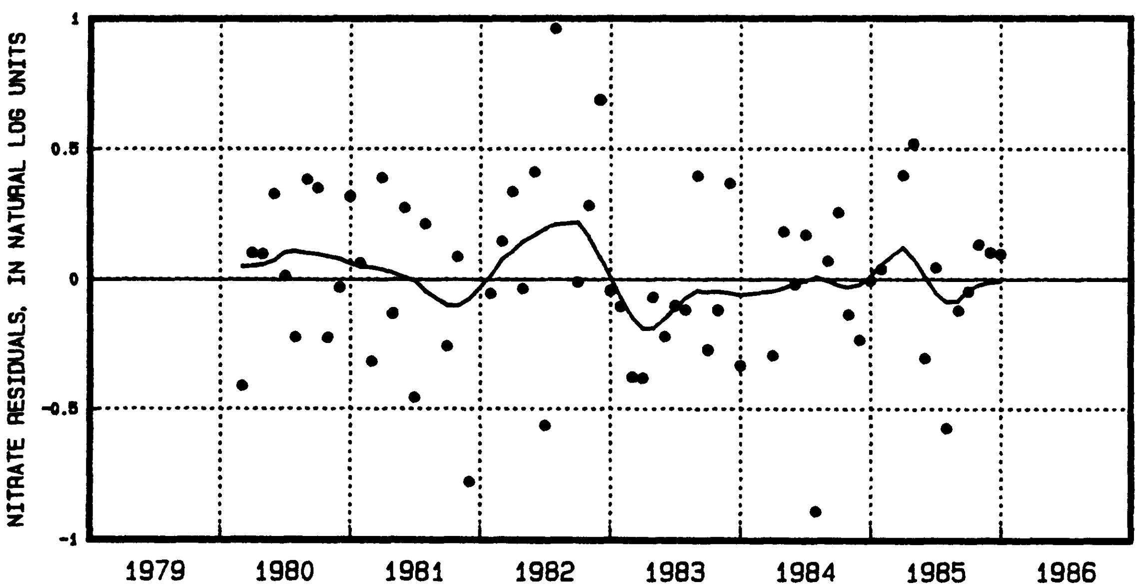


Figure 81.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for season and amount of precipitation, Jasper, New York, site 047a.

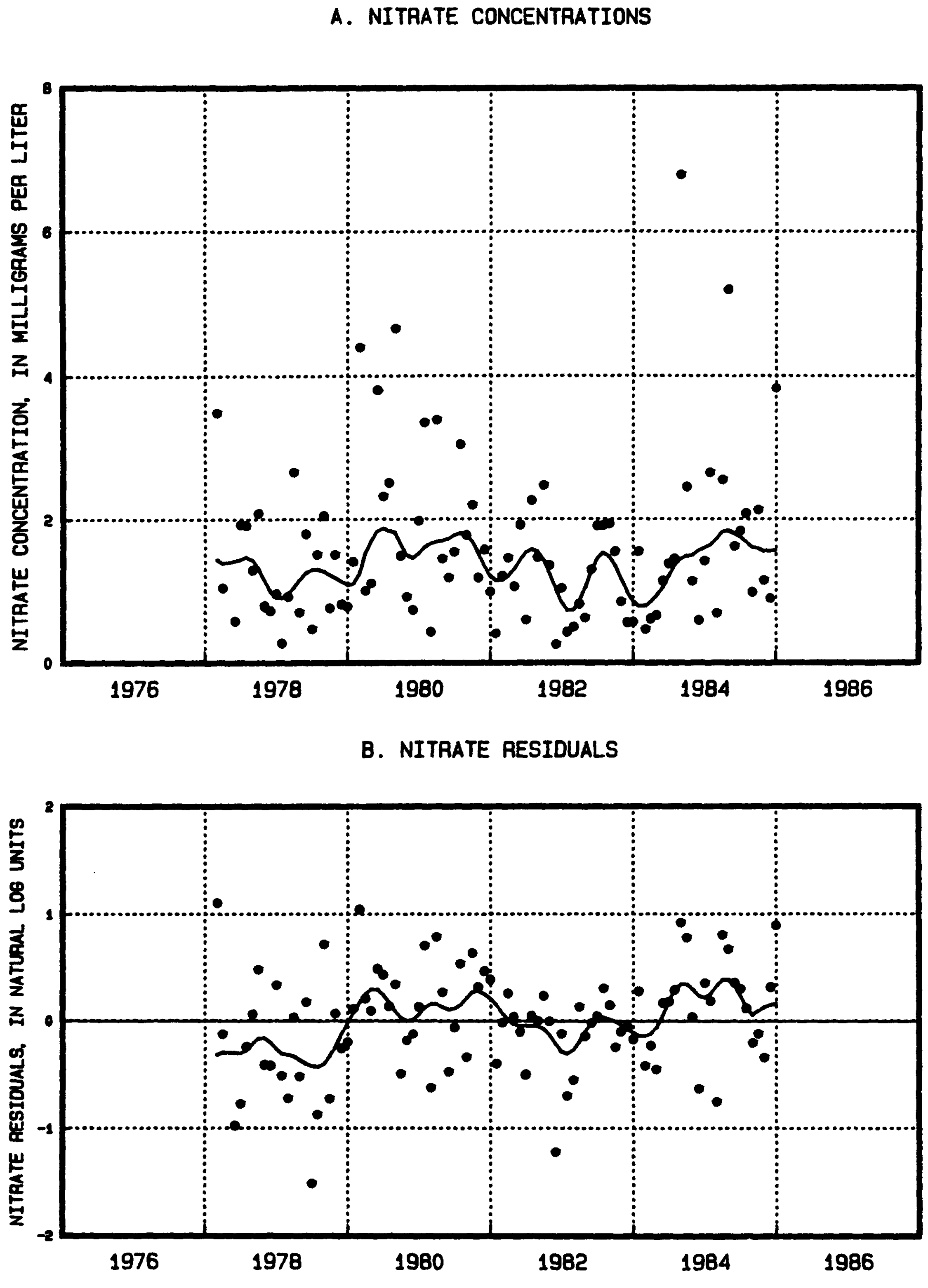


Figure 82.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for season and amountf of precipitation, Brookhaven, New York, site 048a.

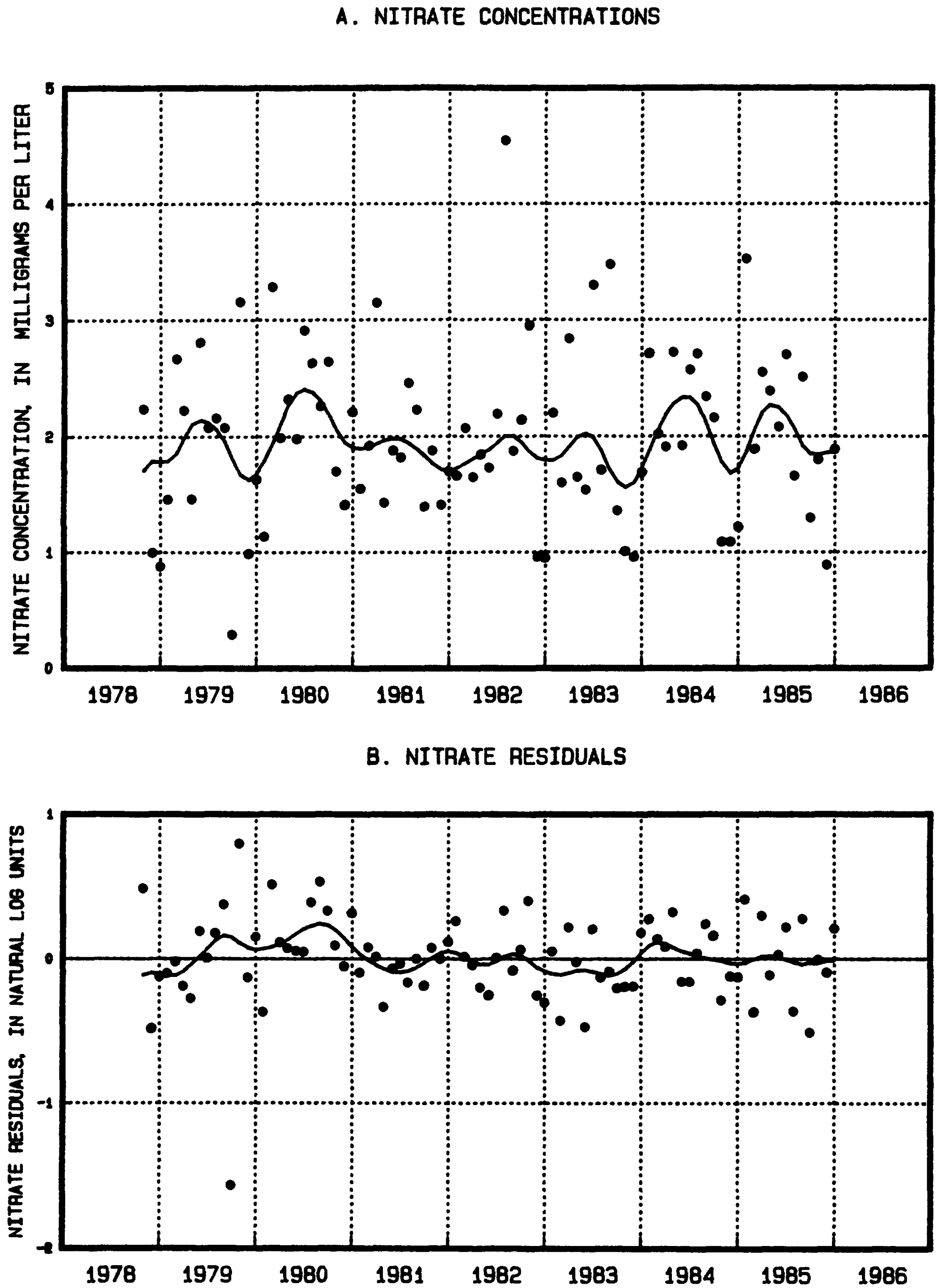
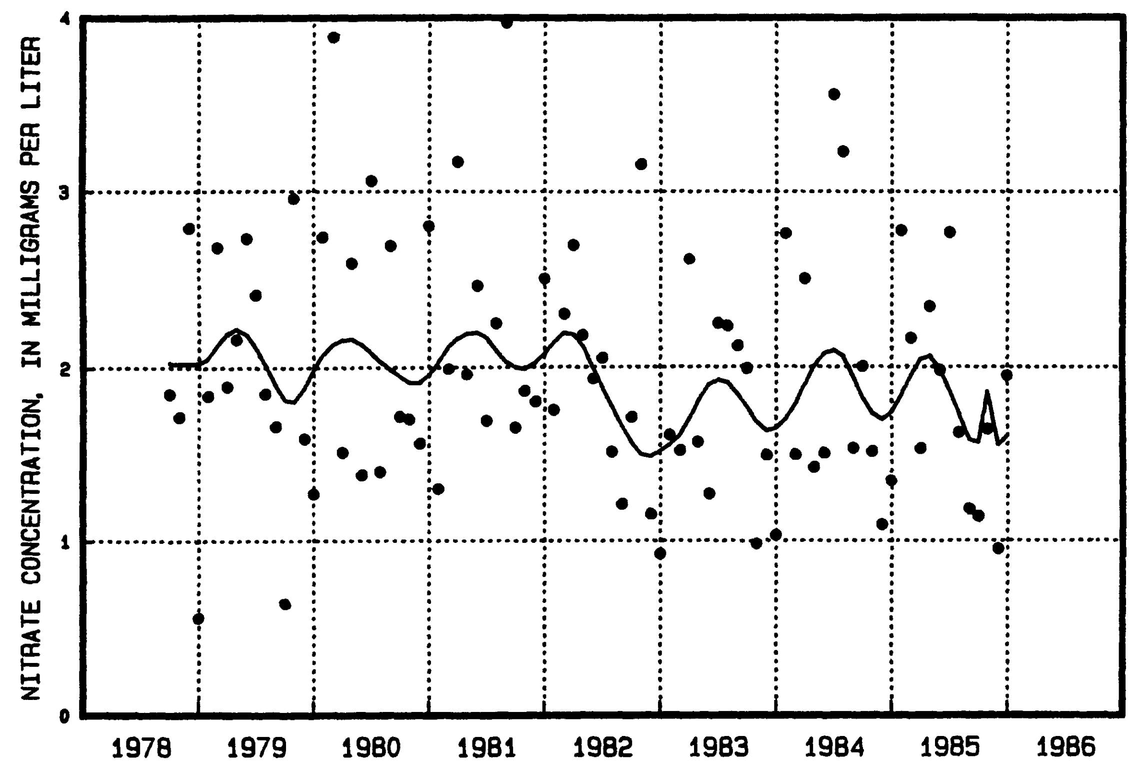


Figure 83.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for season and amount of precipitation, Delaware, Ohio, site 055a.

A. NITRATE CONCENTRATIONS



B. NITRATE RESIDUALS

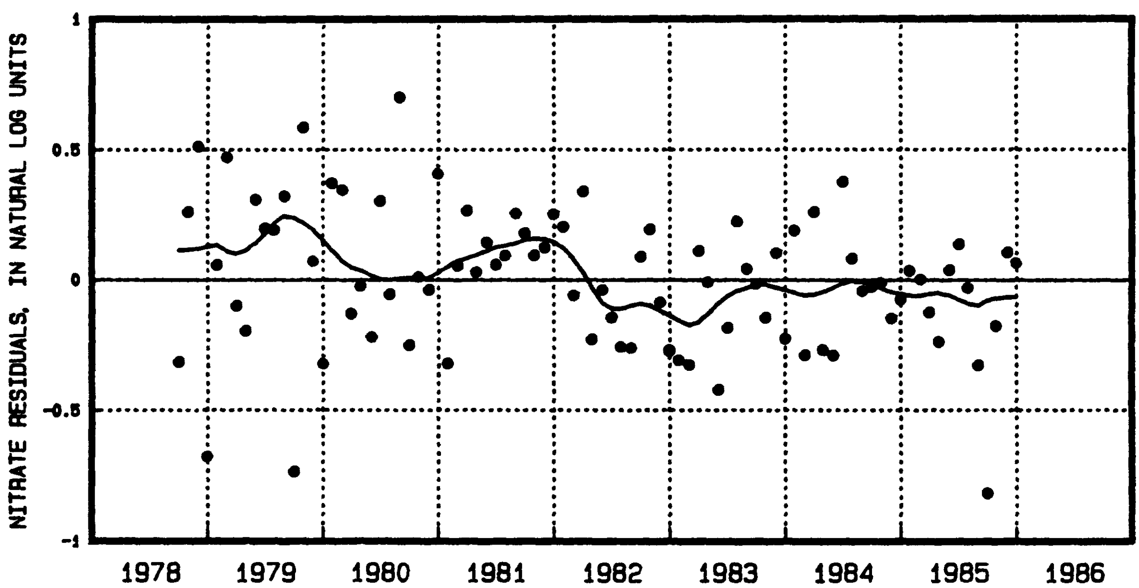
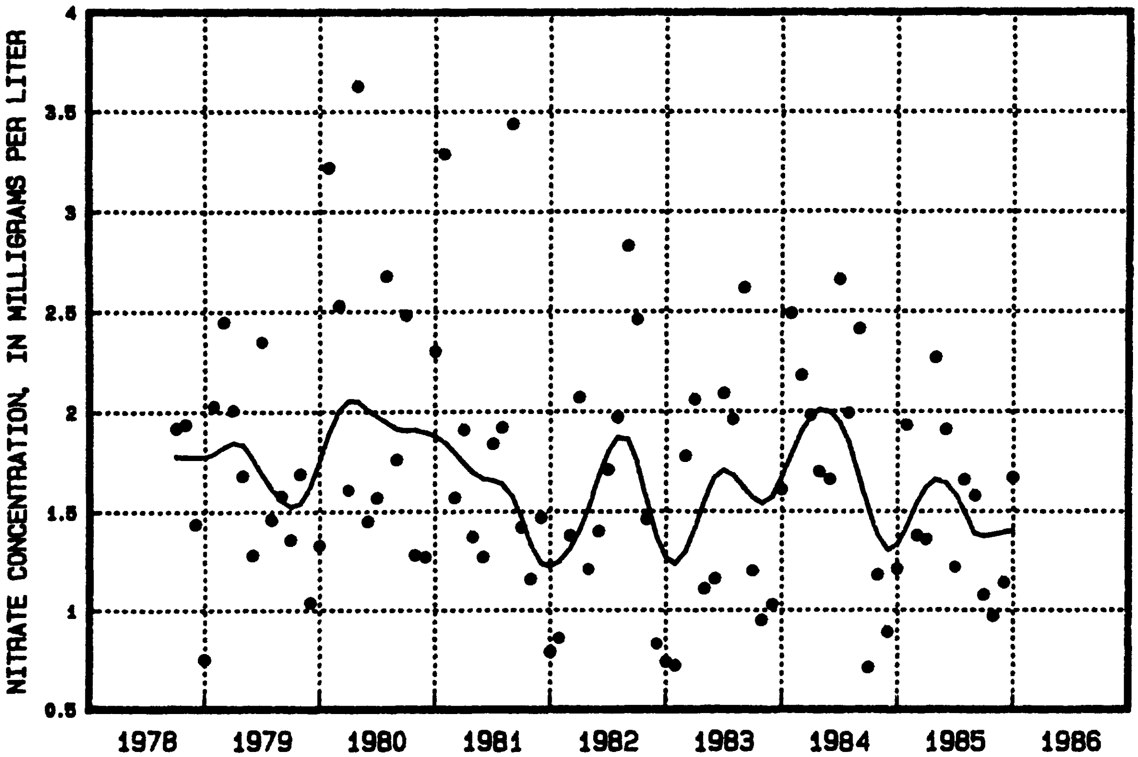


Figure 84.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for season and amount of precipitation, Caldwell, Ohio, site 056a.

A. NITRATE CONCENTRATIONS



B. NITRATE RESIDUALS

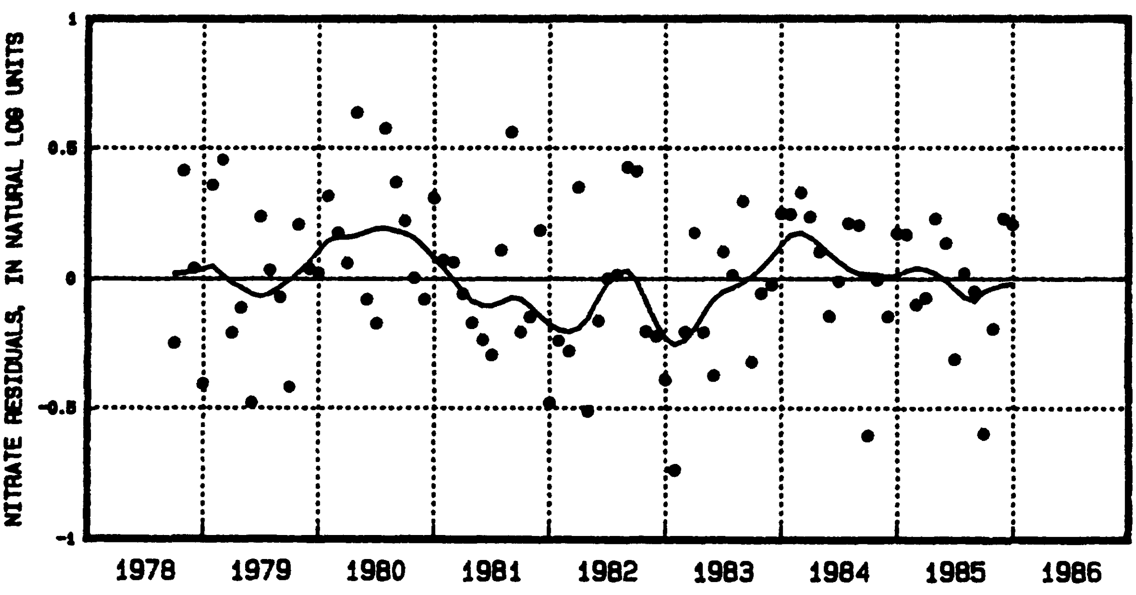


Figure 85.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for season and amount of precipitation, Oxford, Ohio, site 057a.

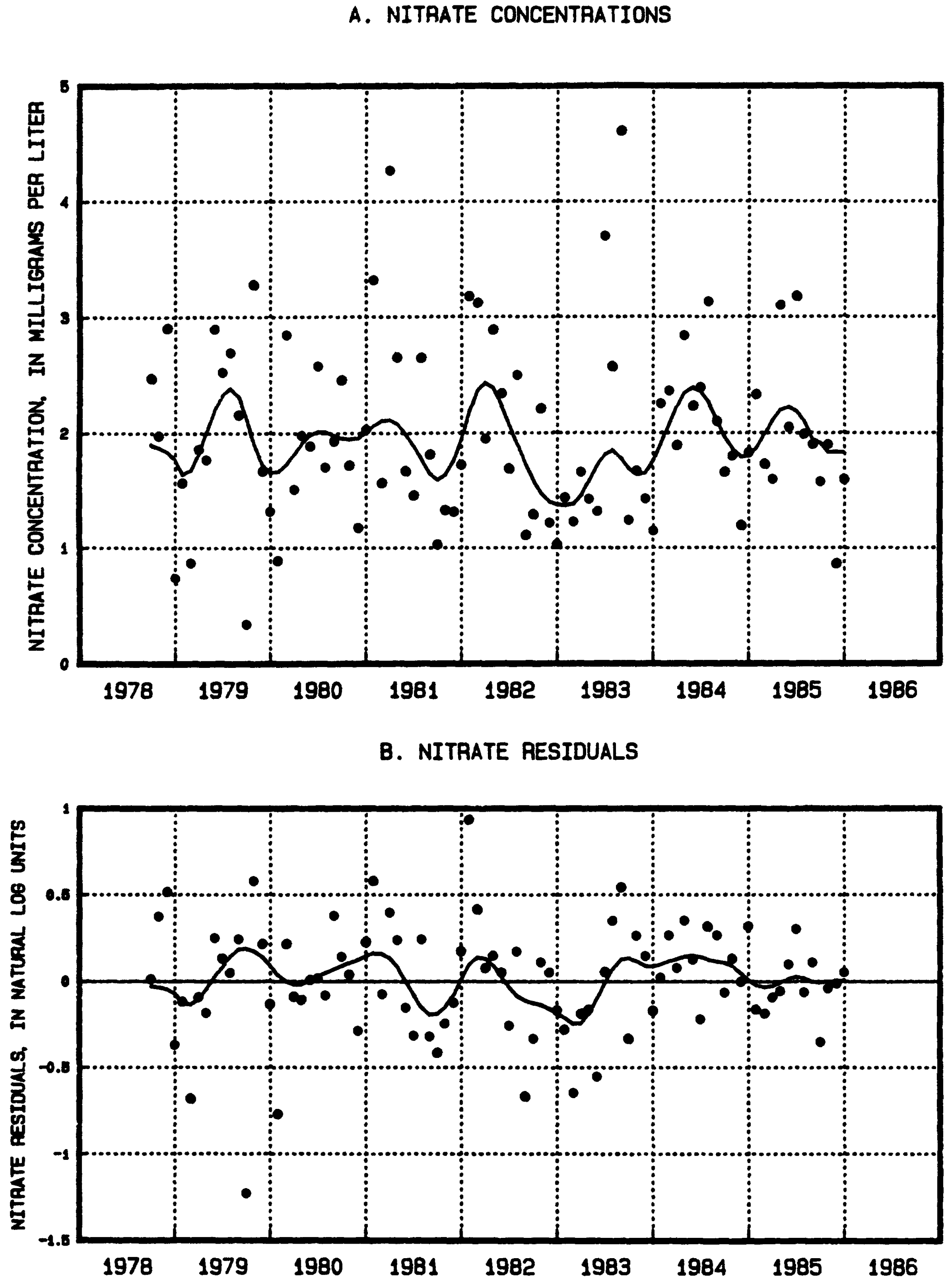
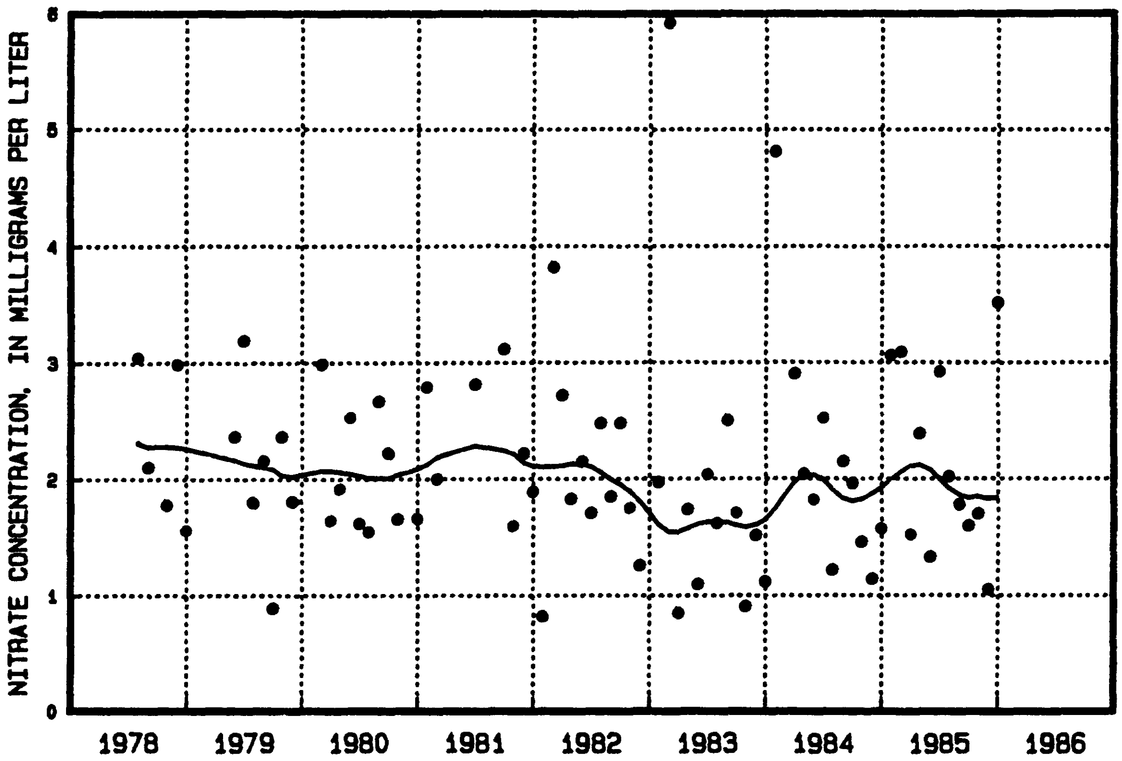


Figure 86.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for season and amount of precipitation, Wooster, Ohio, site 058a.

A. NITRATE CONCENTRATIONS



B. NITRATE RESIDUALS

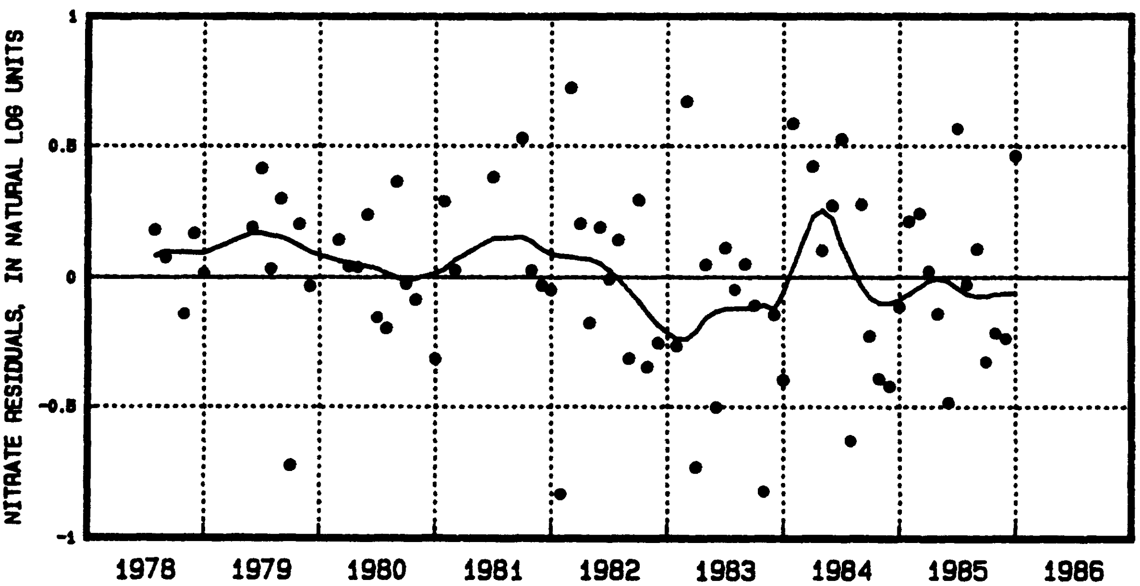


Figure 87.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for amount of precipitation, Kane, Pennsylvania, site 063a.

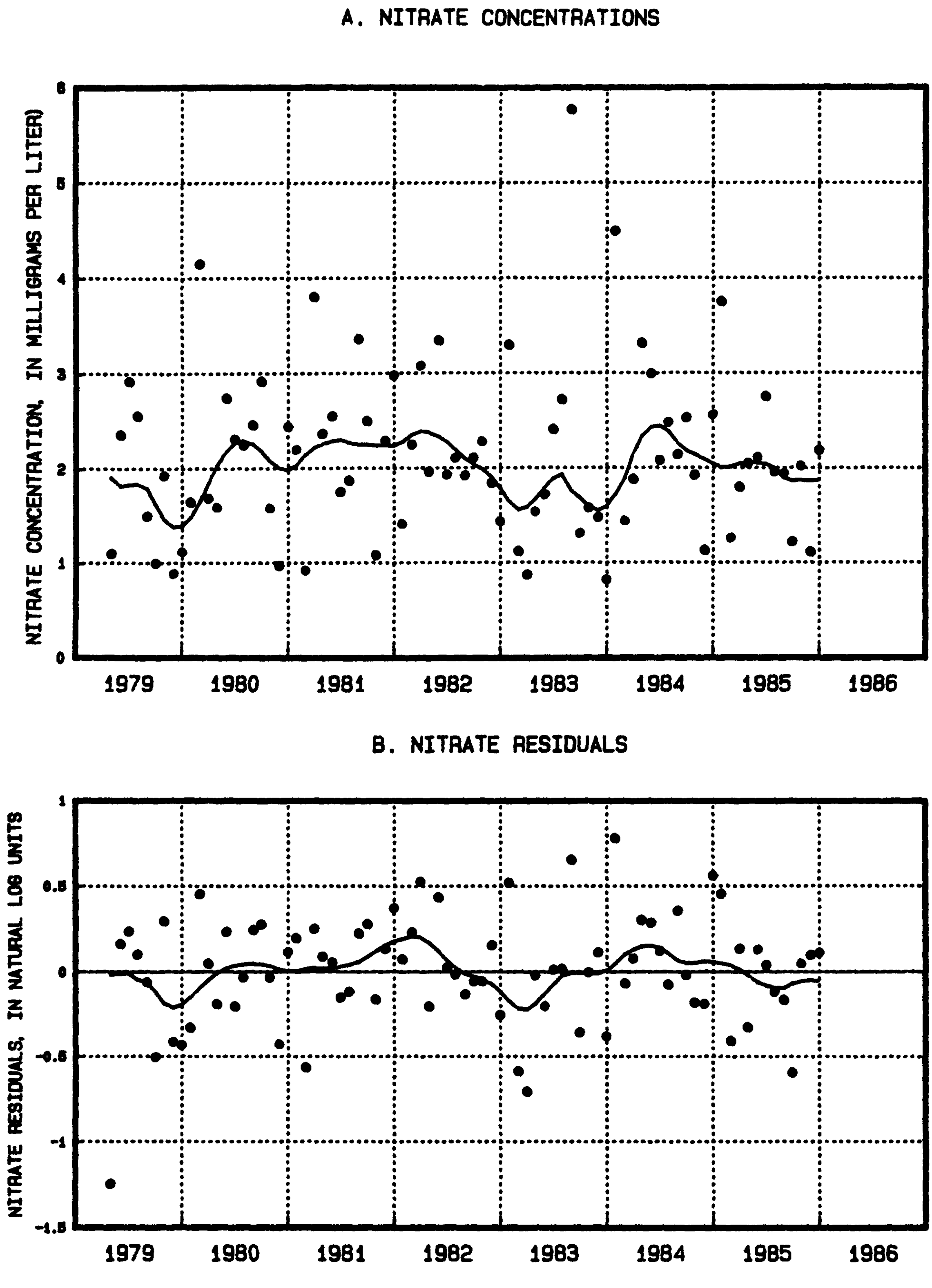
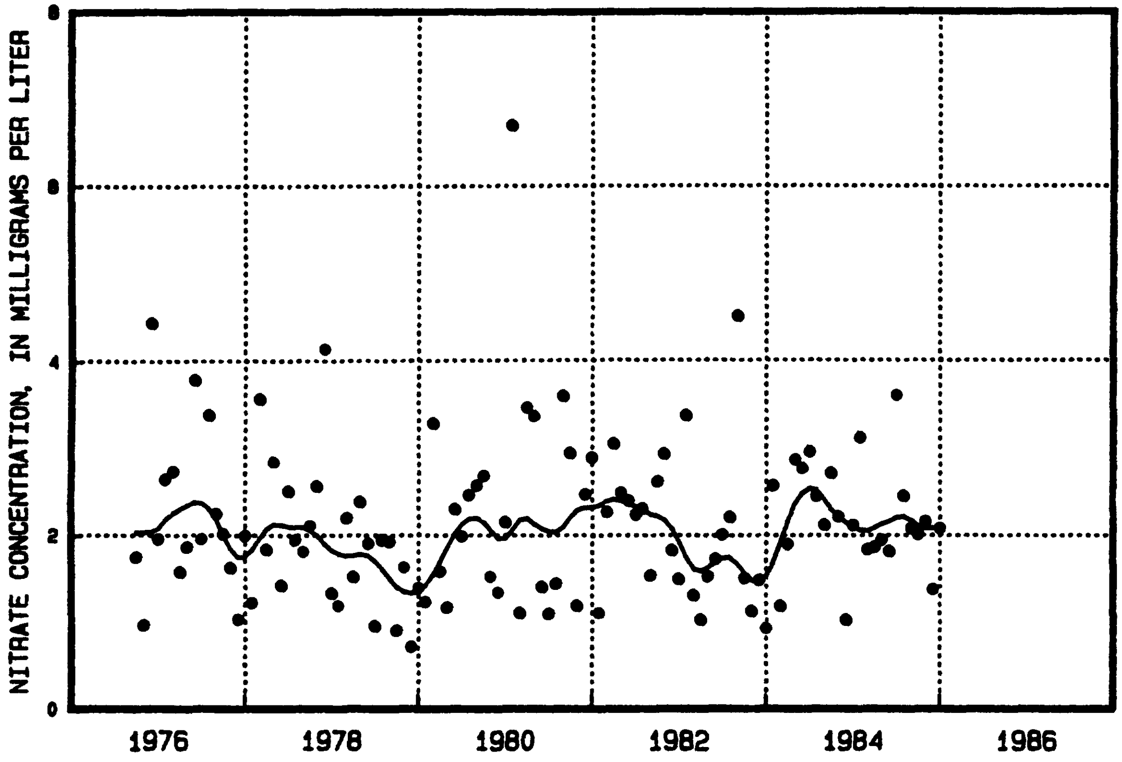


Figure 88.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for season and amount of precipitation, Pennsylvania, site 064a.

A. NITRATE CONCENTRATIONS



B. NITRATE RESIDUALS

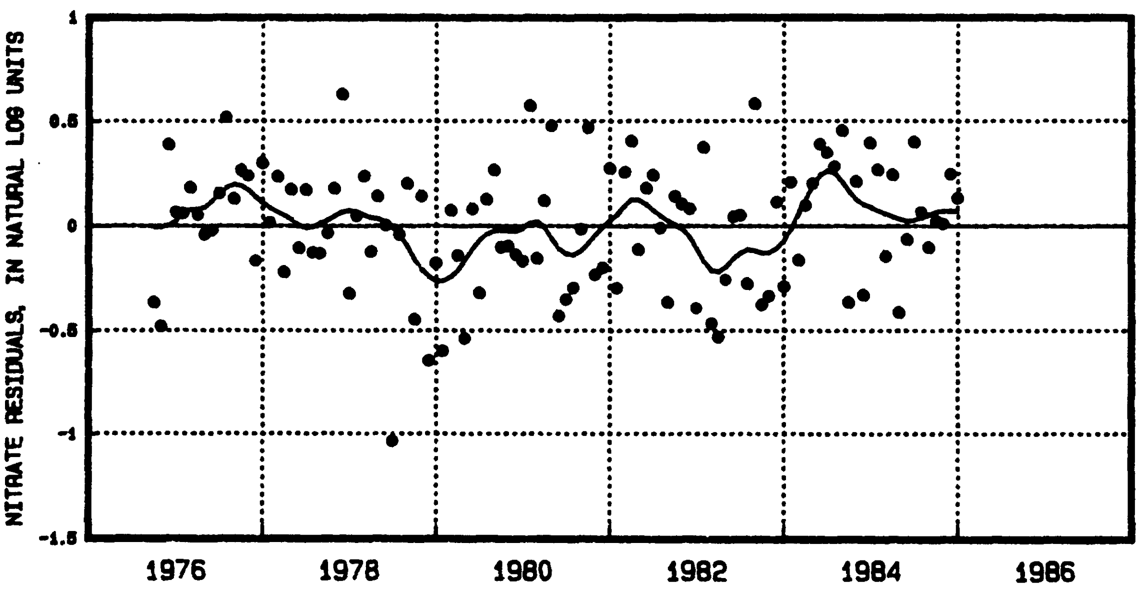


Figure 89.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for season and amount of precipitation, Penn State, Pennsylvania, site 065a.

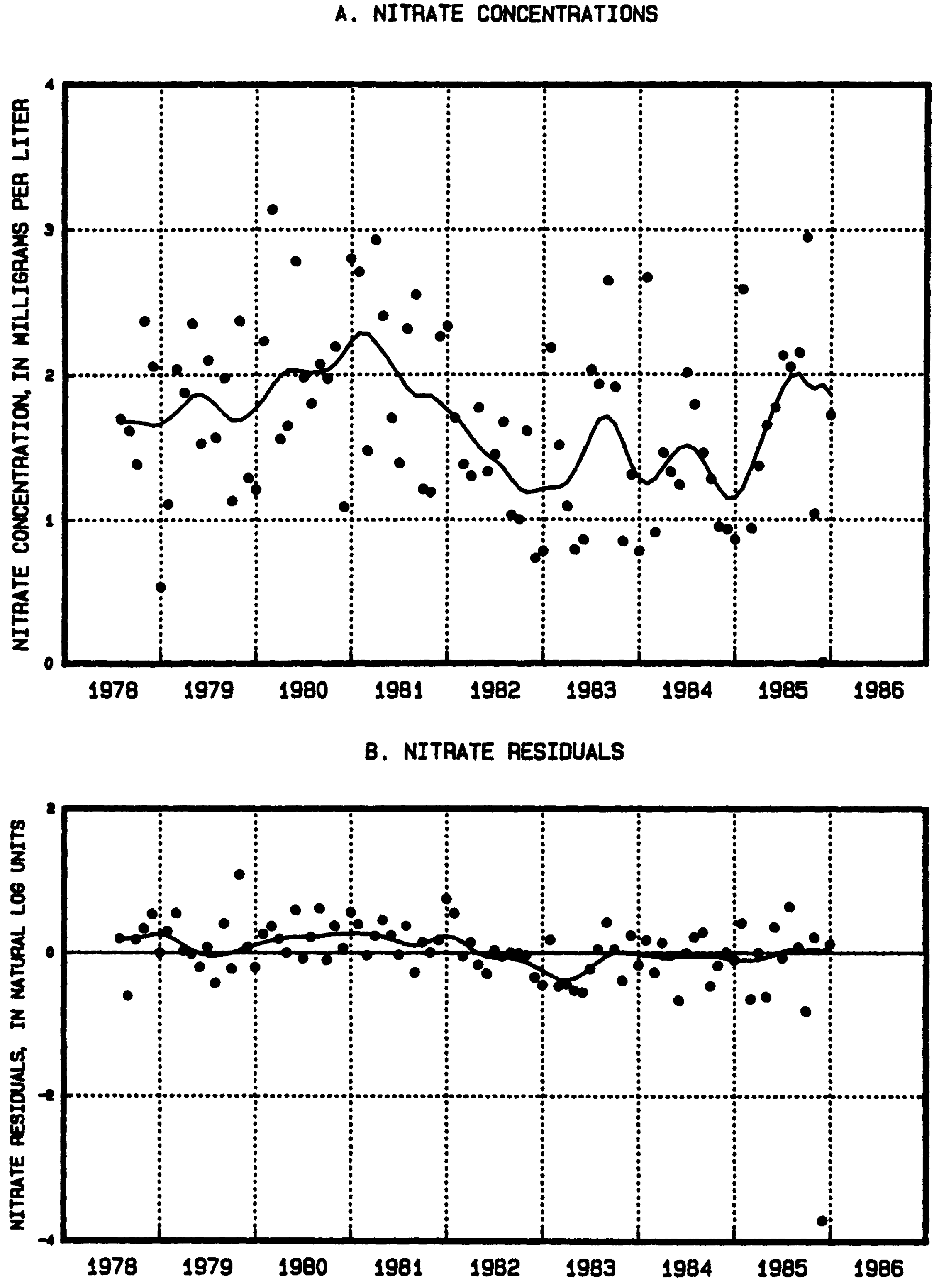
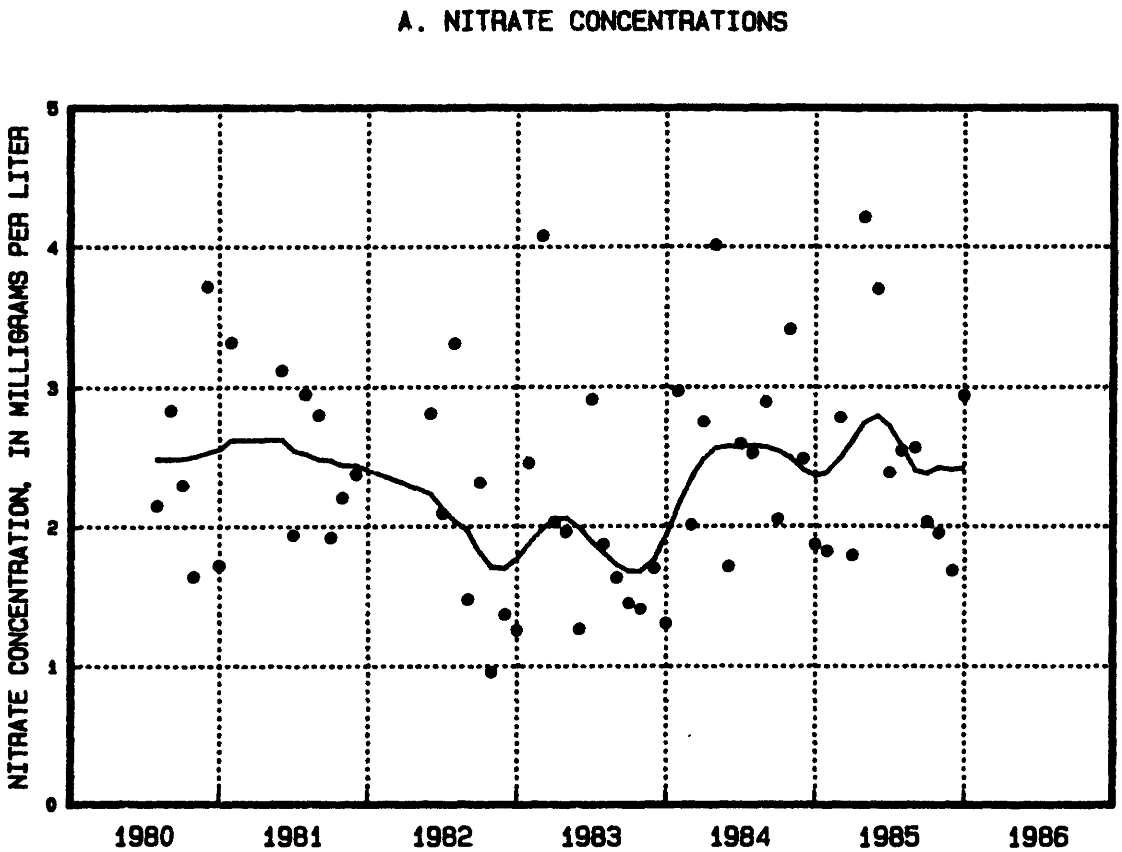


Figure 90.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for season and amount of precipitation, Parsons, West Virginia, site 075a.



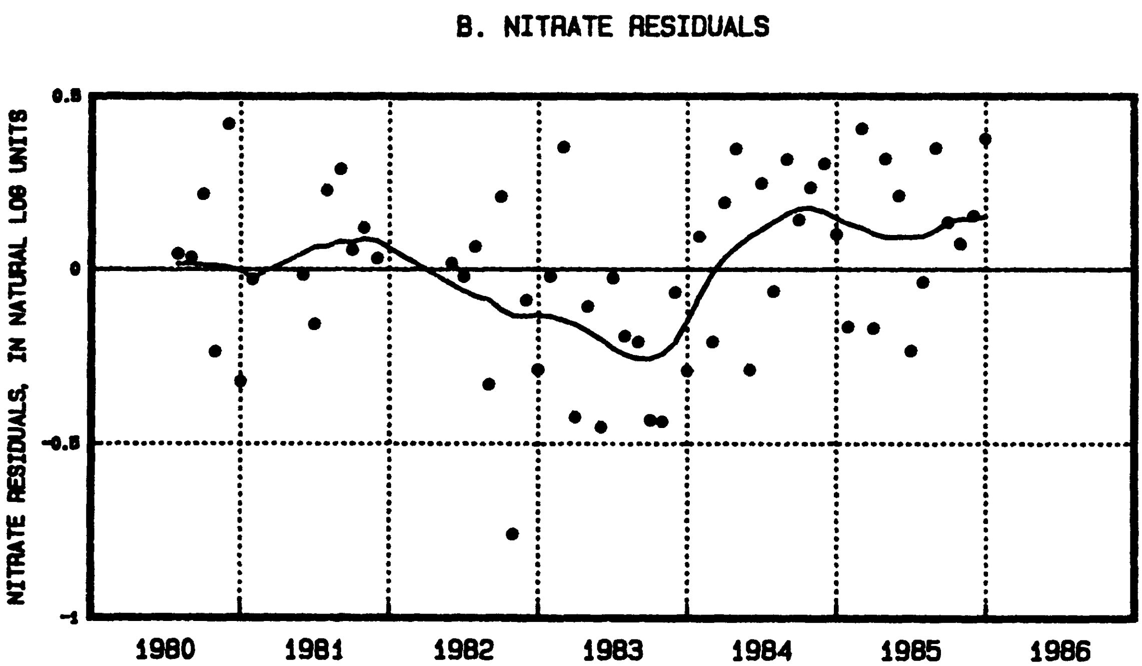


Figure 91.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for season and amount of precipitation, Longwoods, Ontario, site 143b.

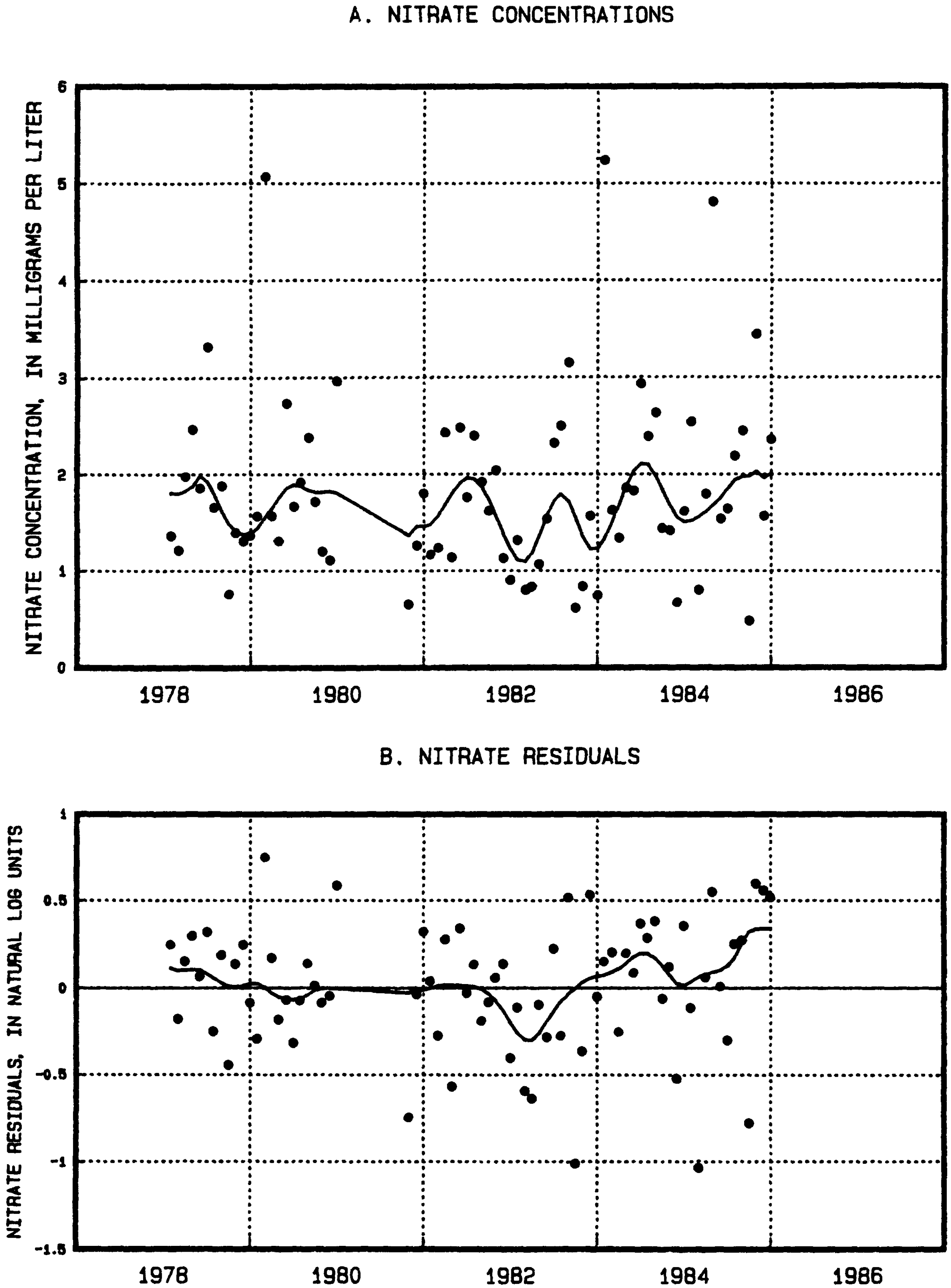
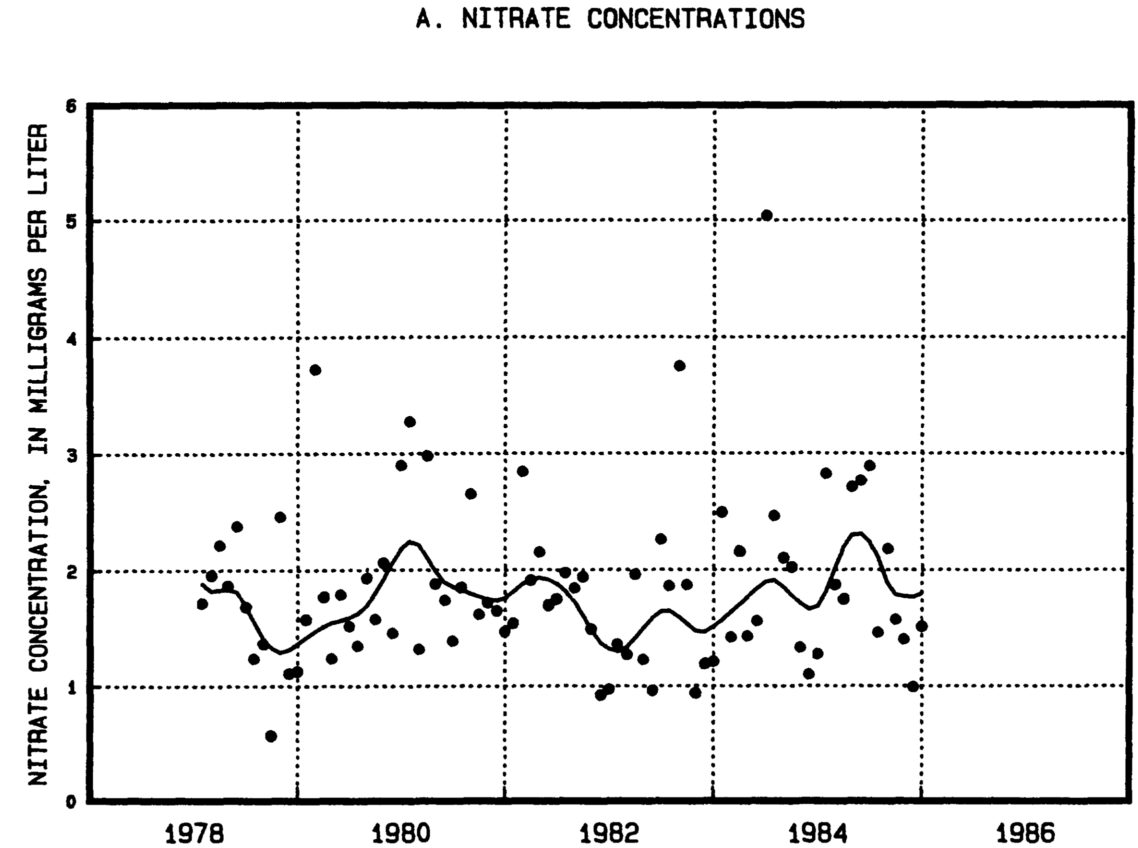


Figure 92.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for season and amount of precipitation, Scranton, Pennsylvania, site 151a.



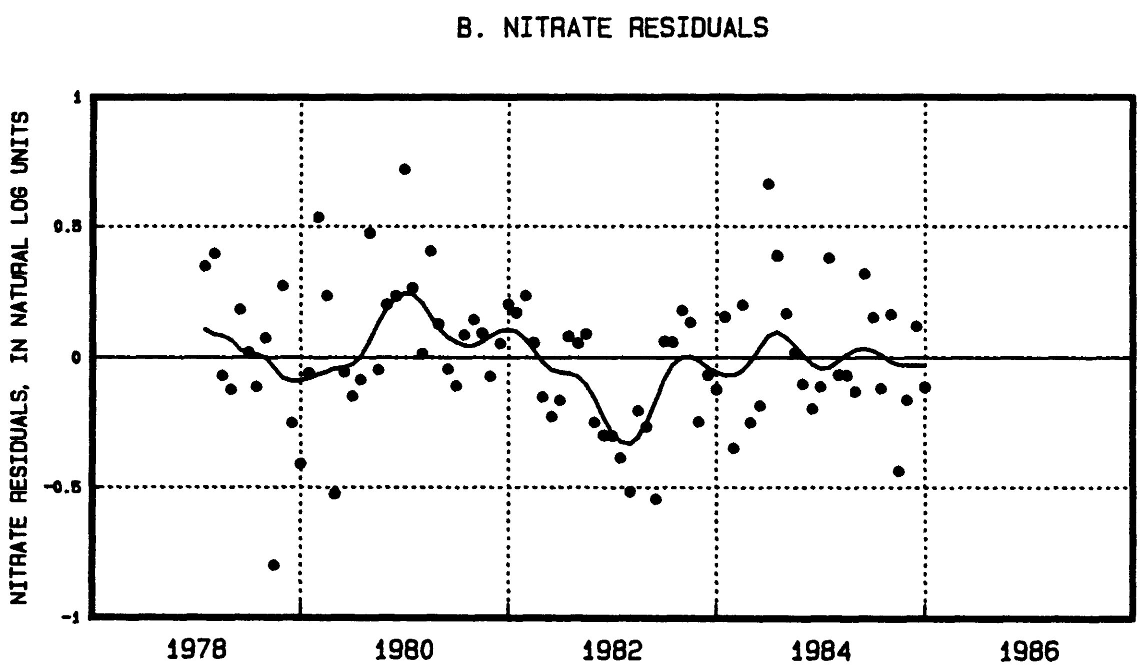


Figure 93.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for season and amount of precipitation, Zanesville, Ohio, site 153a.

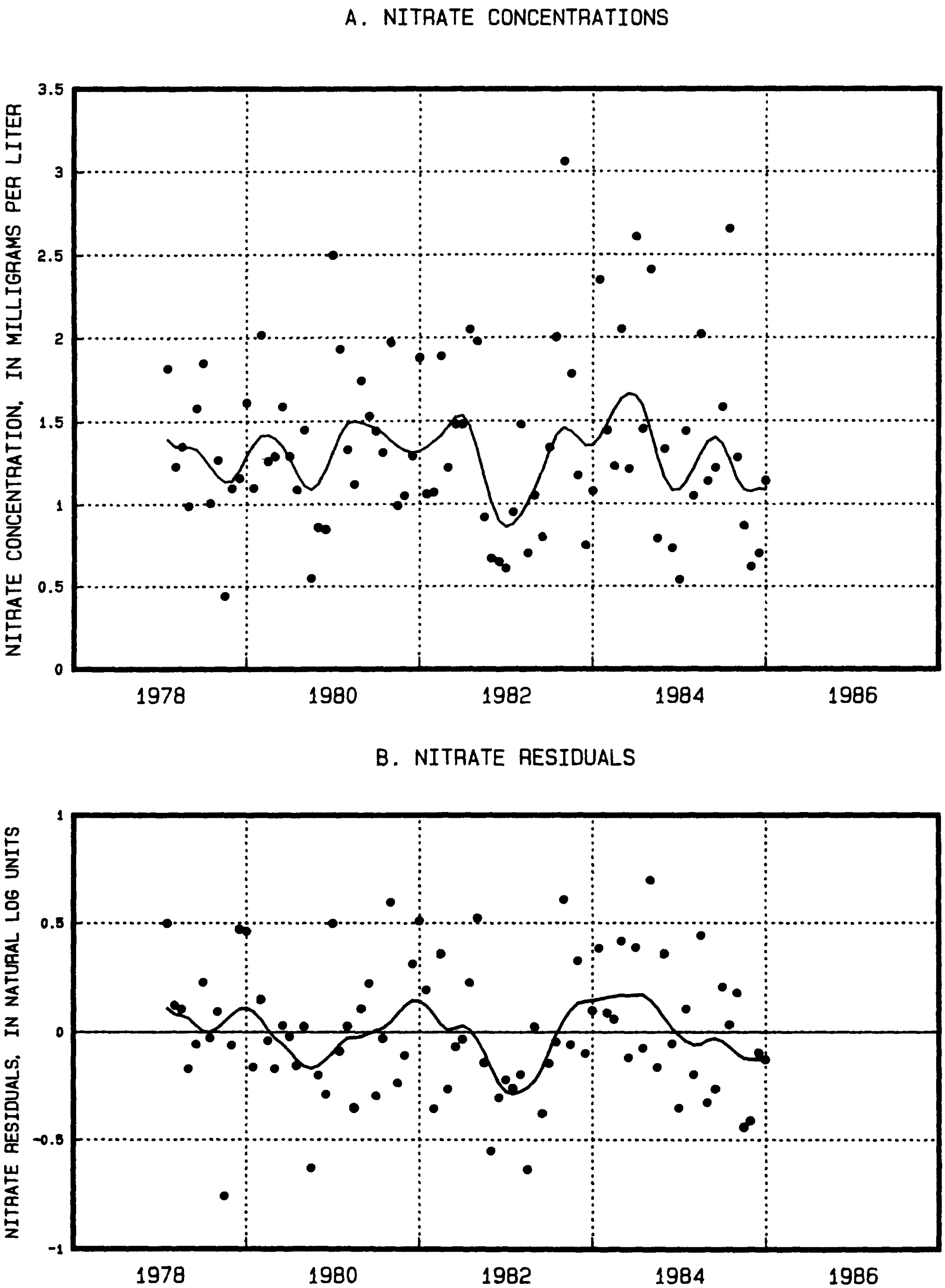


Figure 94.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for season and amount of precipitation, Rockport, Indiana, site 154a.

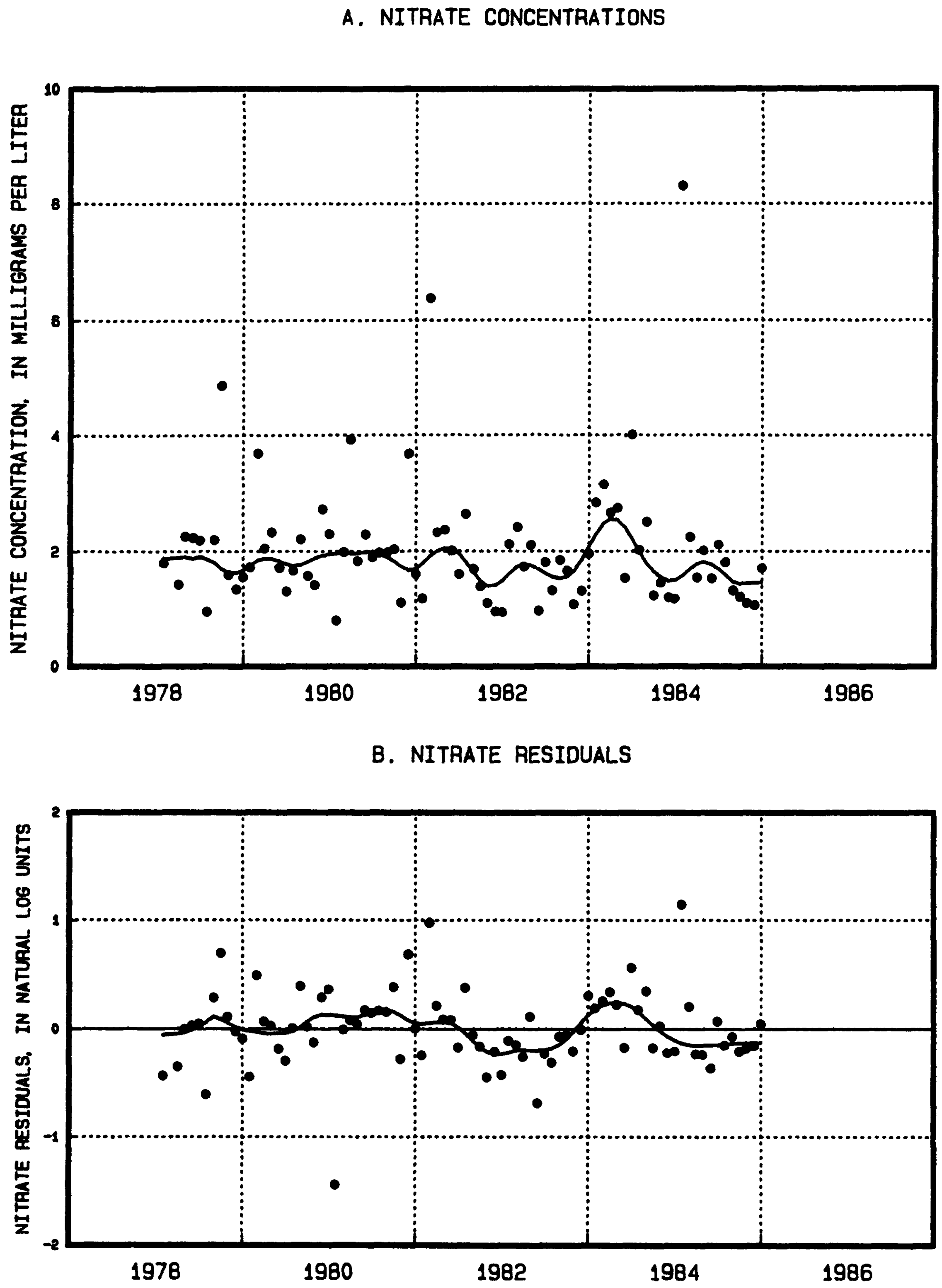
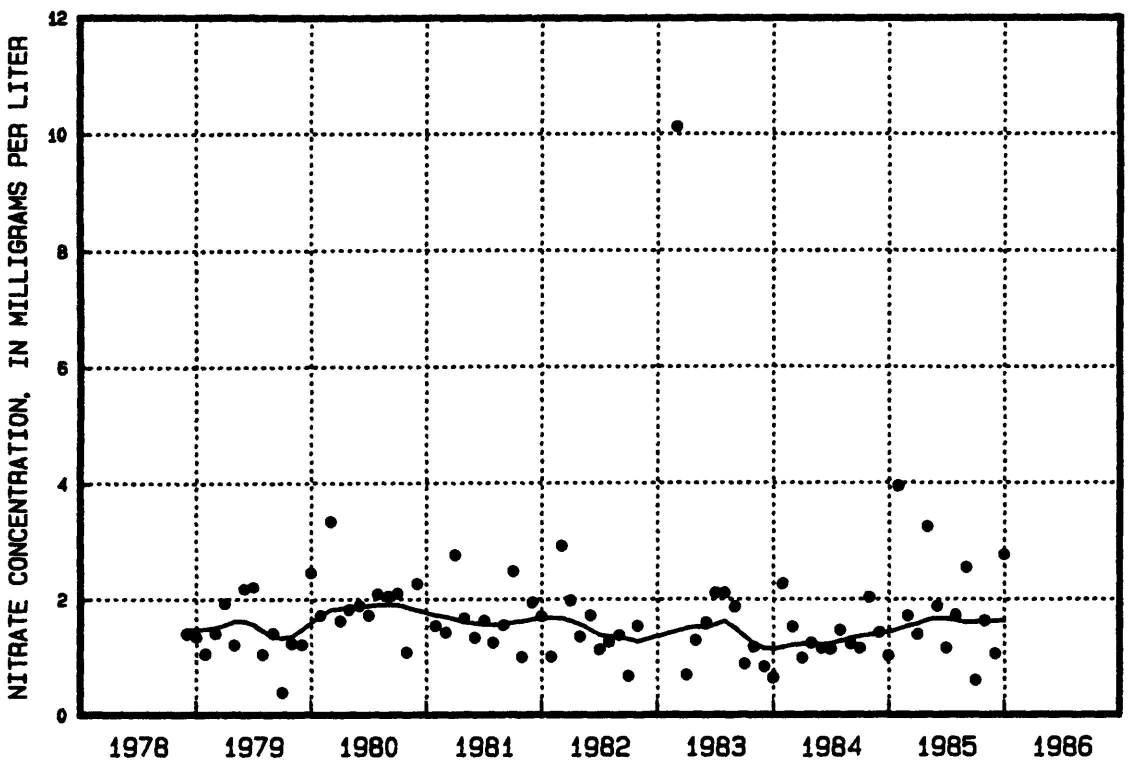


Figure 95.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for season and amount of precipitation, Fort Wayne, Indiana, site 156a.

A. NITRATE CONCENTRATIONS



B. NITRATE RESIDUALS

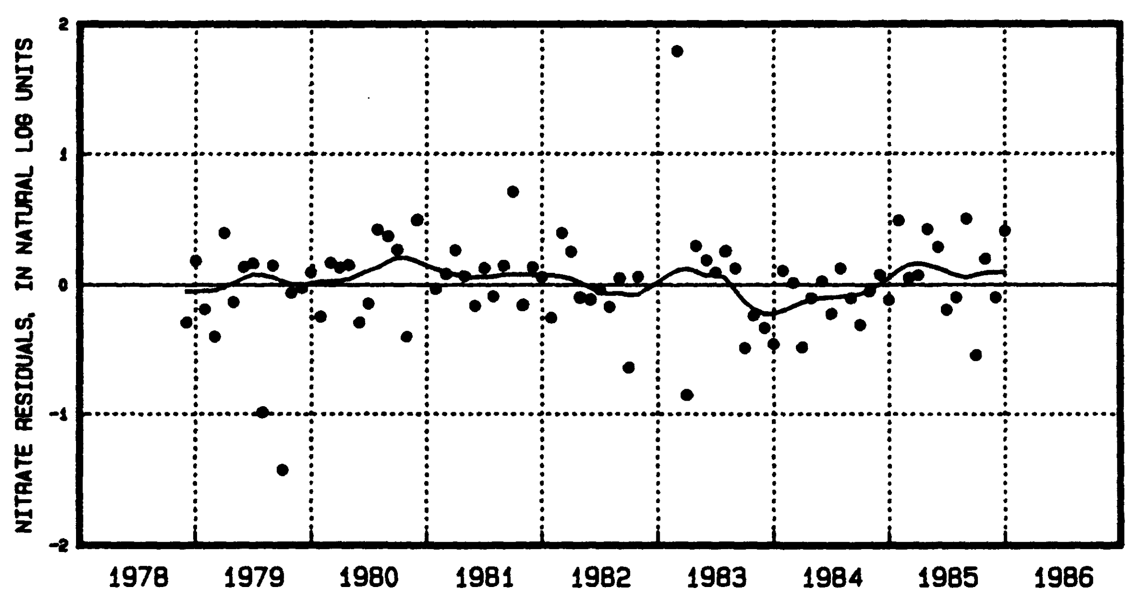


Figure 96.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for amount of precipitation, Huntington, New York, site 168a.

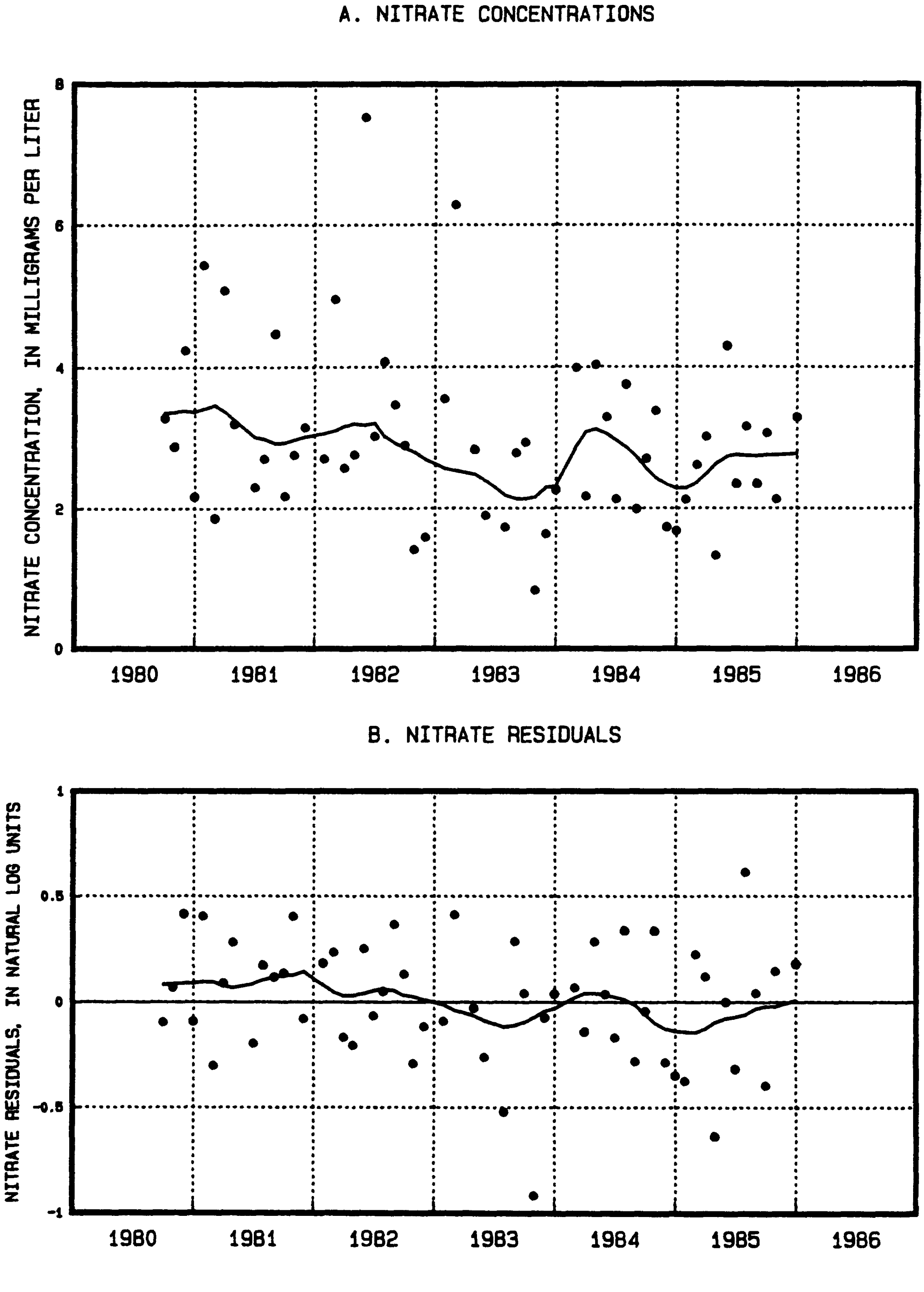
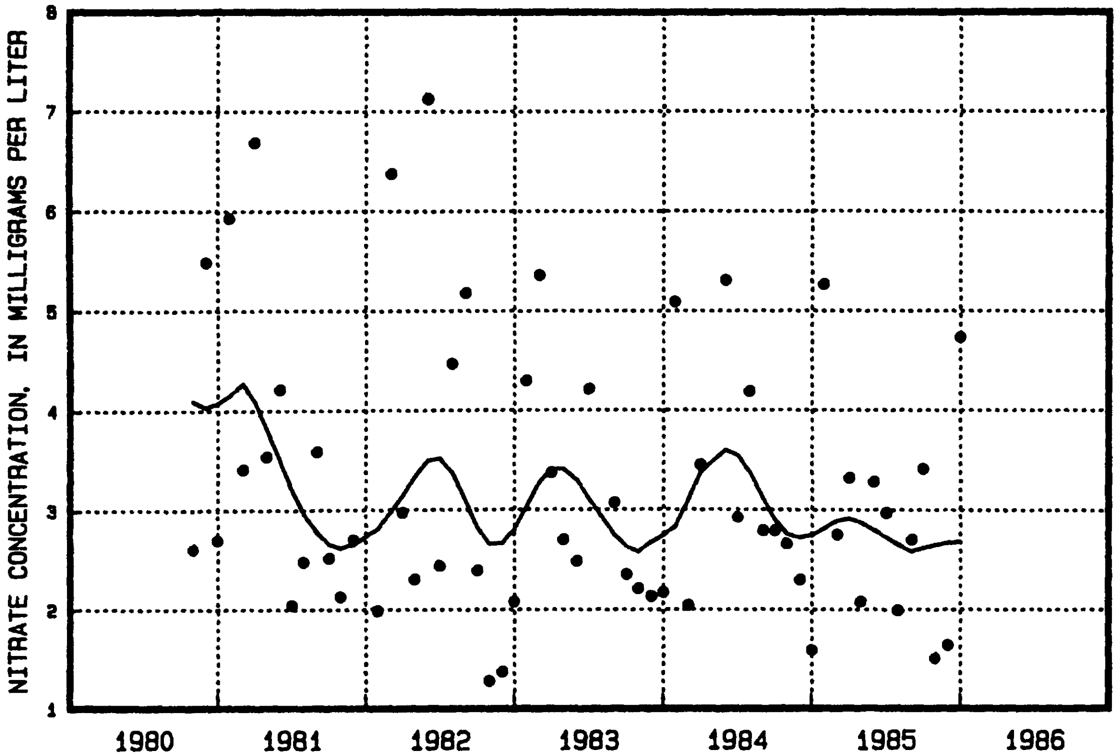


Figure 97.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for season and amount of precipitation, Colchester, Ontario, site 176a.

A. NITRATE CONCENTRATIONS



B. NITRATE RESIDUALS

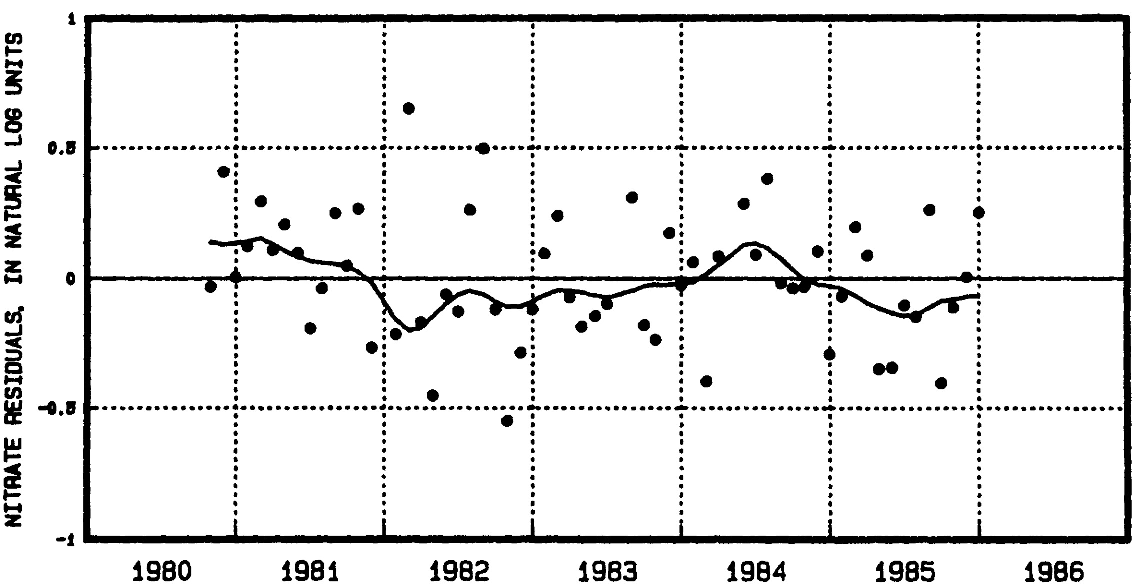


Figure 98.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for season and amount of precipitation, Merlin, Ontario, site 177a.

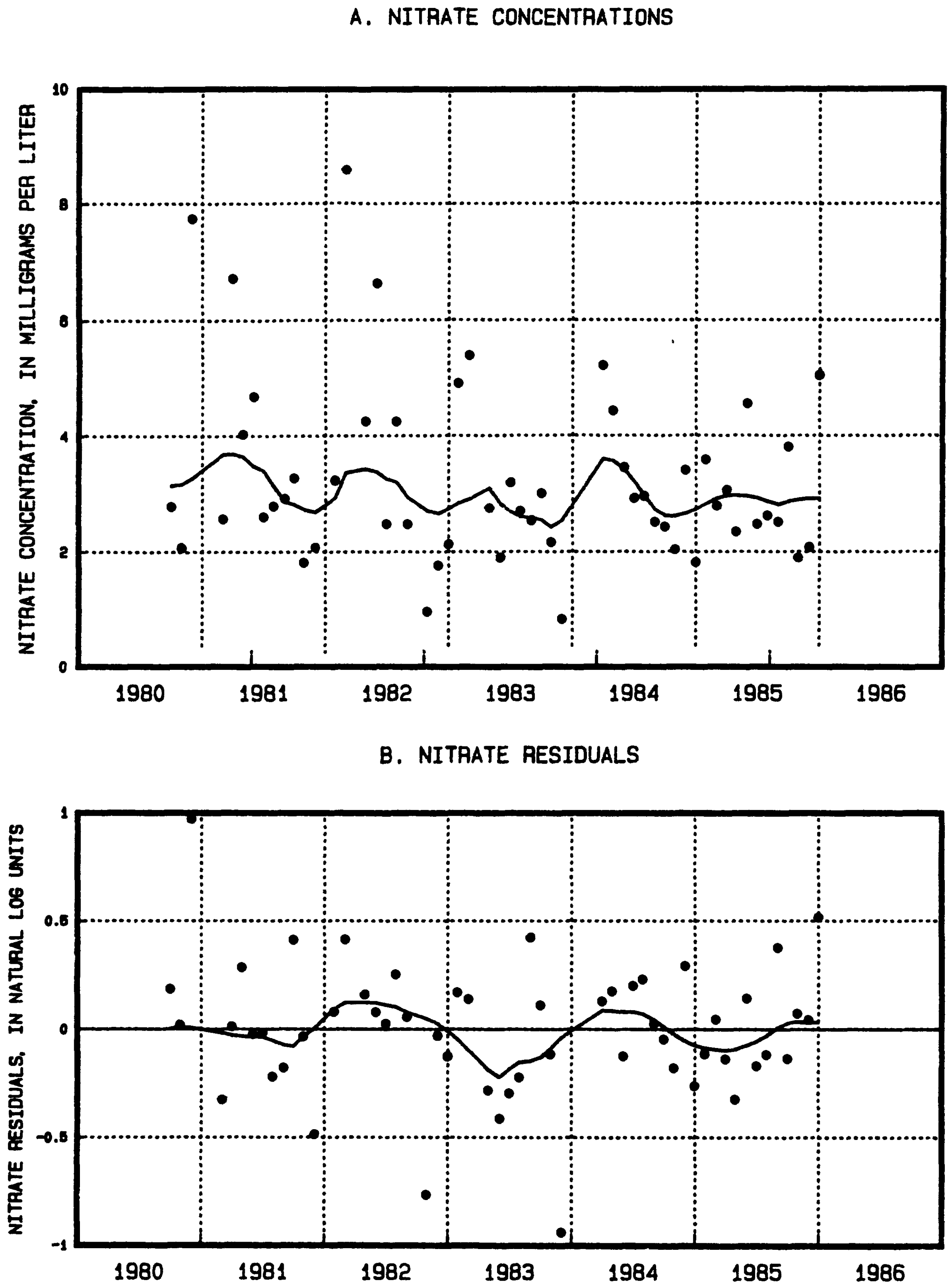
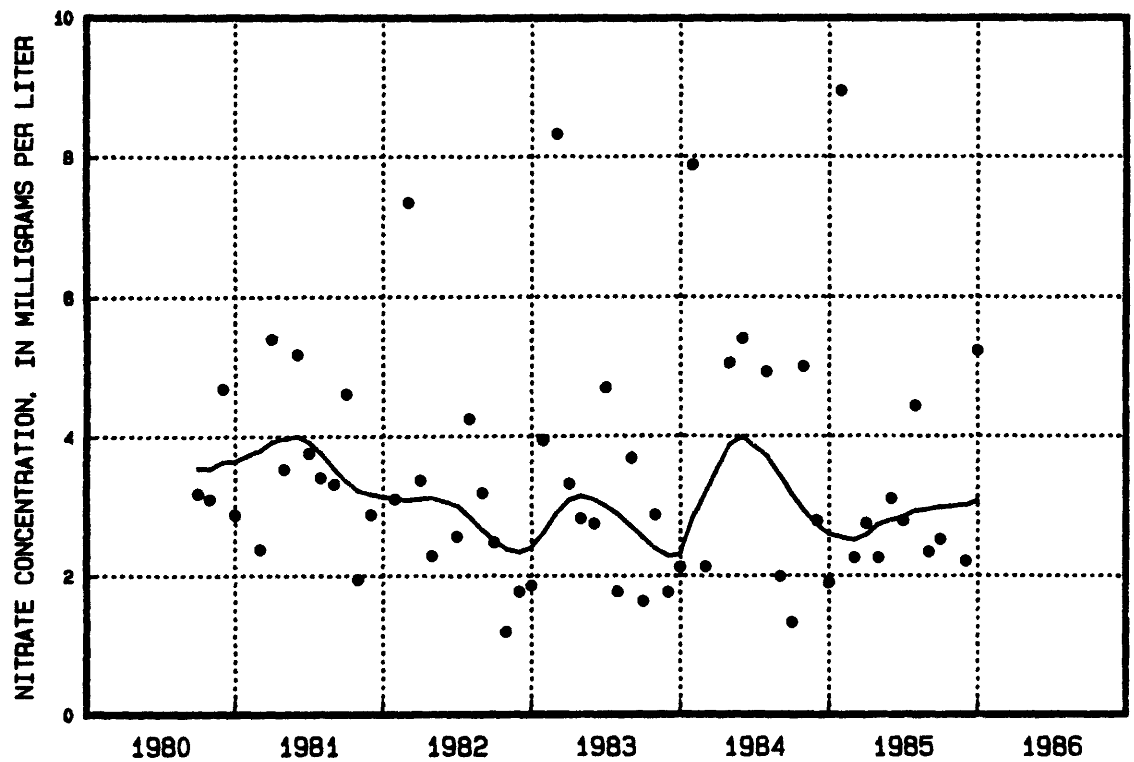


Figure 99.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for season and amount of precipitation, Port Stanley, Ontario, site 178a.

A. NITRATE CONCENTRATIONS



B. NITRATE RESIDUALS

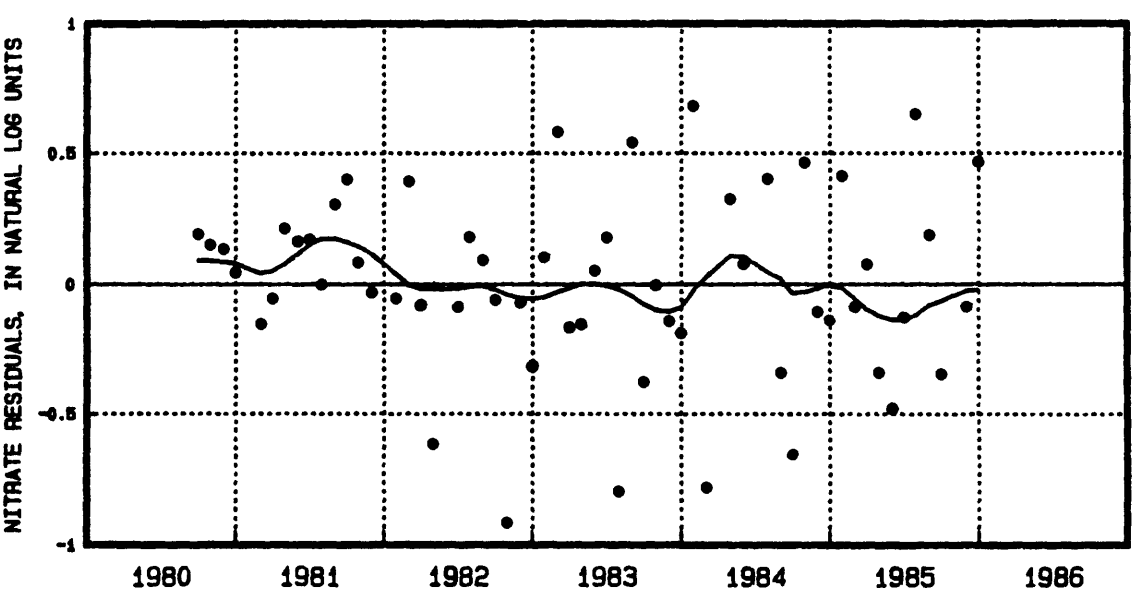


Figure 100.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for season and amount of precipitation, Wilkesport, Ontario, site 179a.

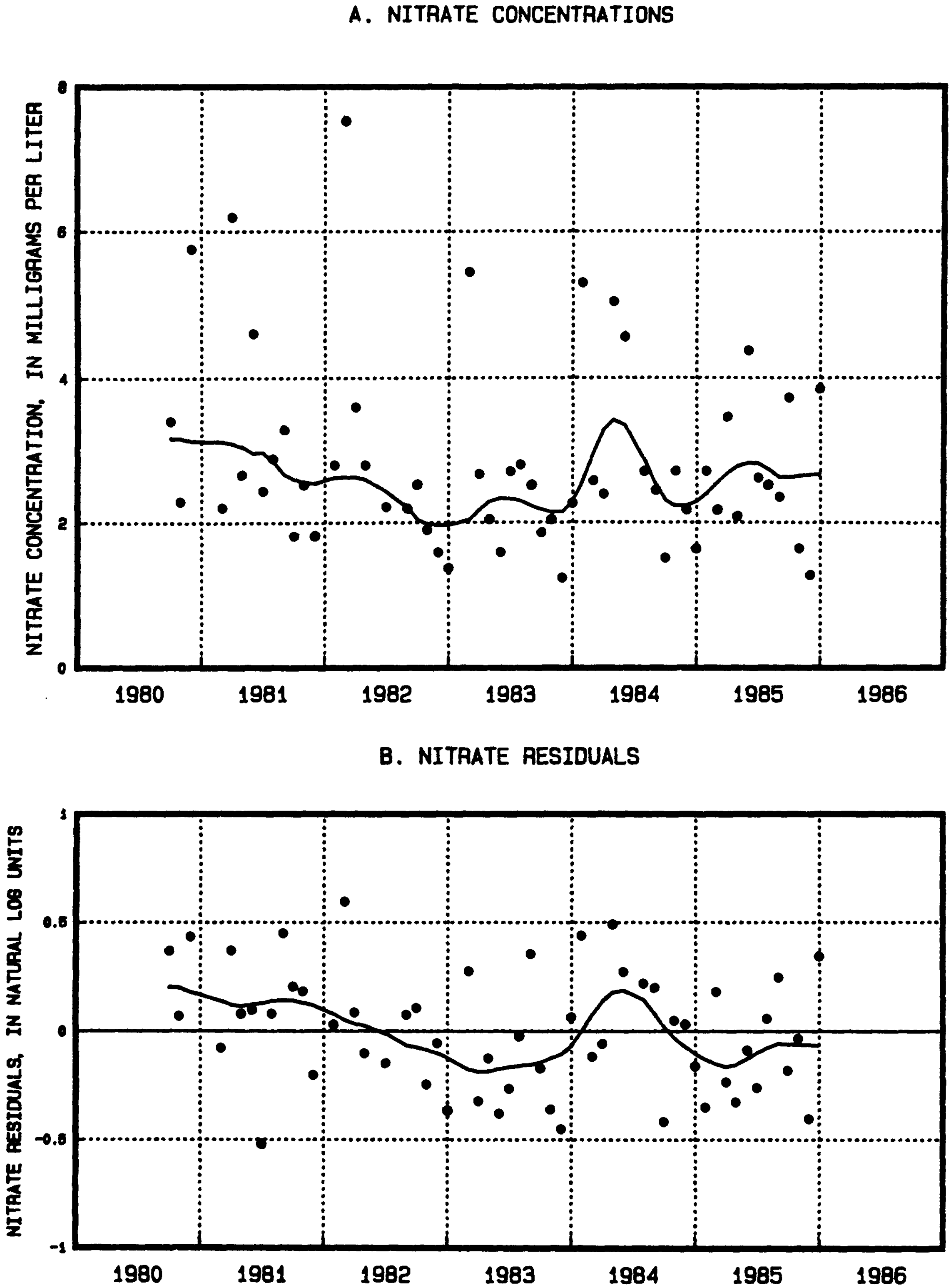


Figure 101.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for season and amount of precipitation, Alvinston, Ontario, site 180a.

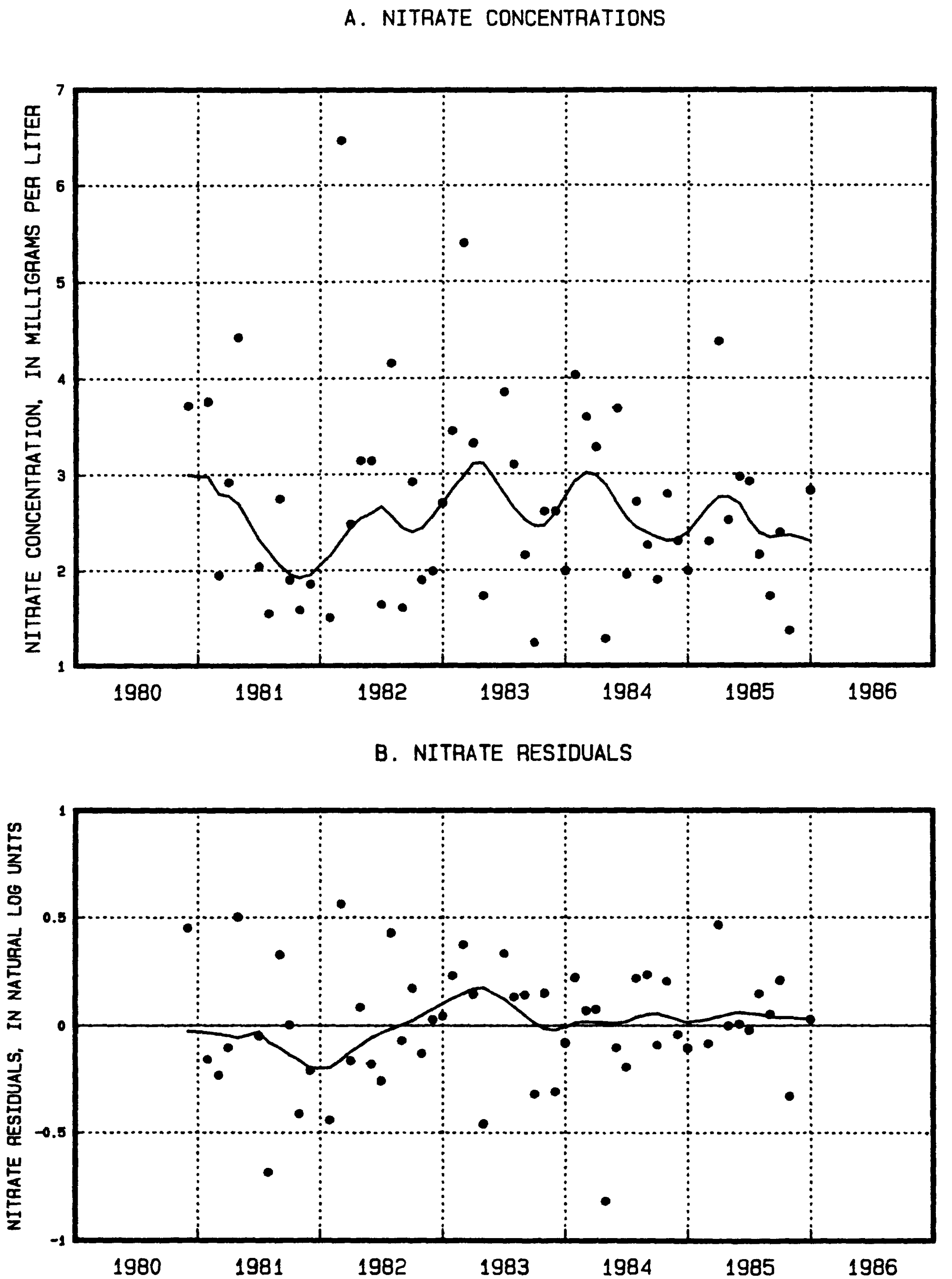
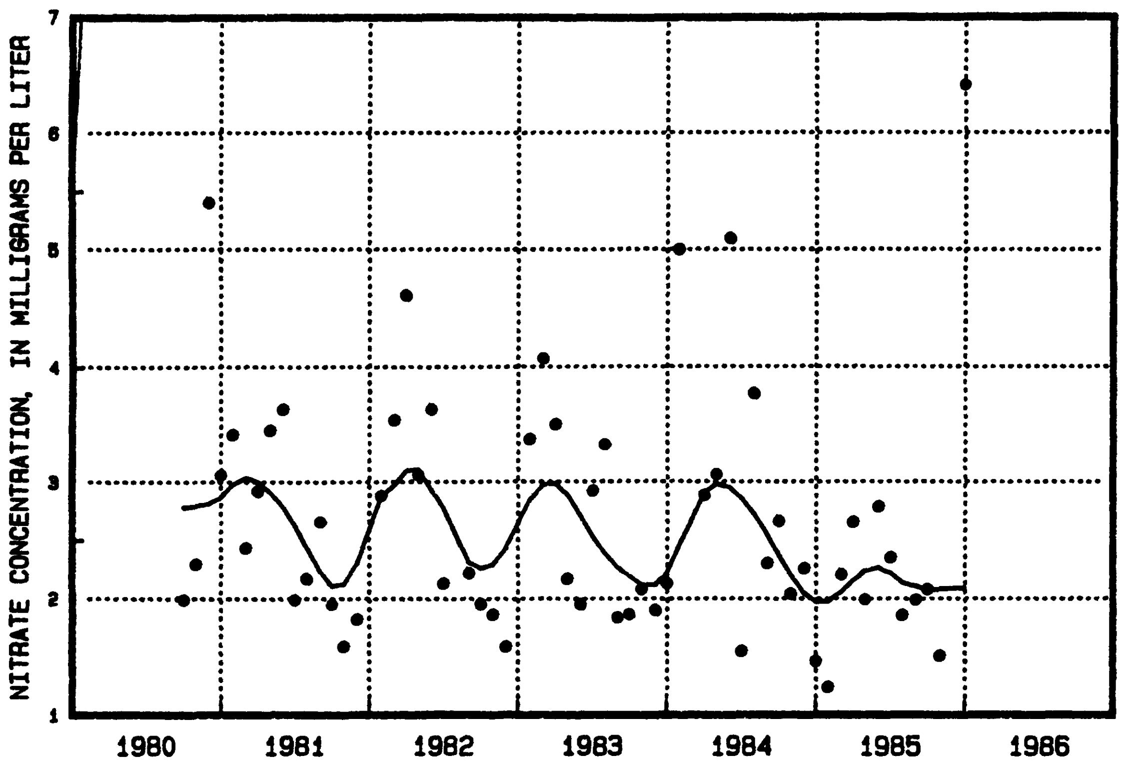


Figure 102.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for season and amount of precipitation, Shallow Lake, Ontario, site 181a.

A. NITRATE CONCENTRATIONS



B. NITRATE RESIDUALS

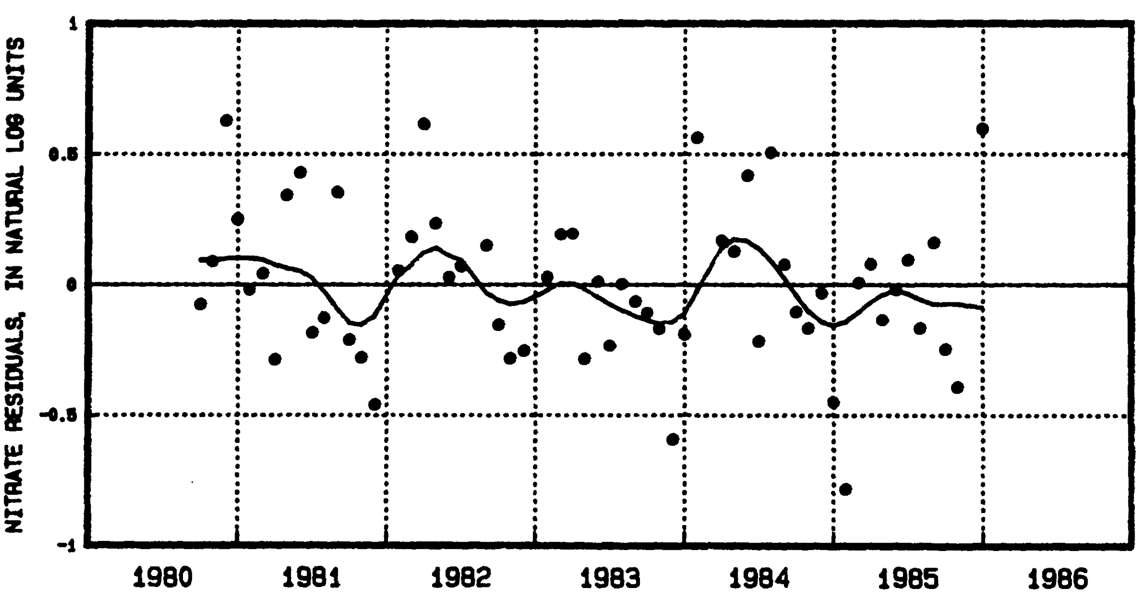


Figure 103.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted amount of precipitation, Palmerston, Ontario, site 182a.

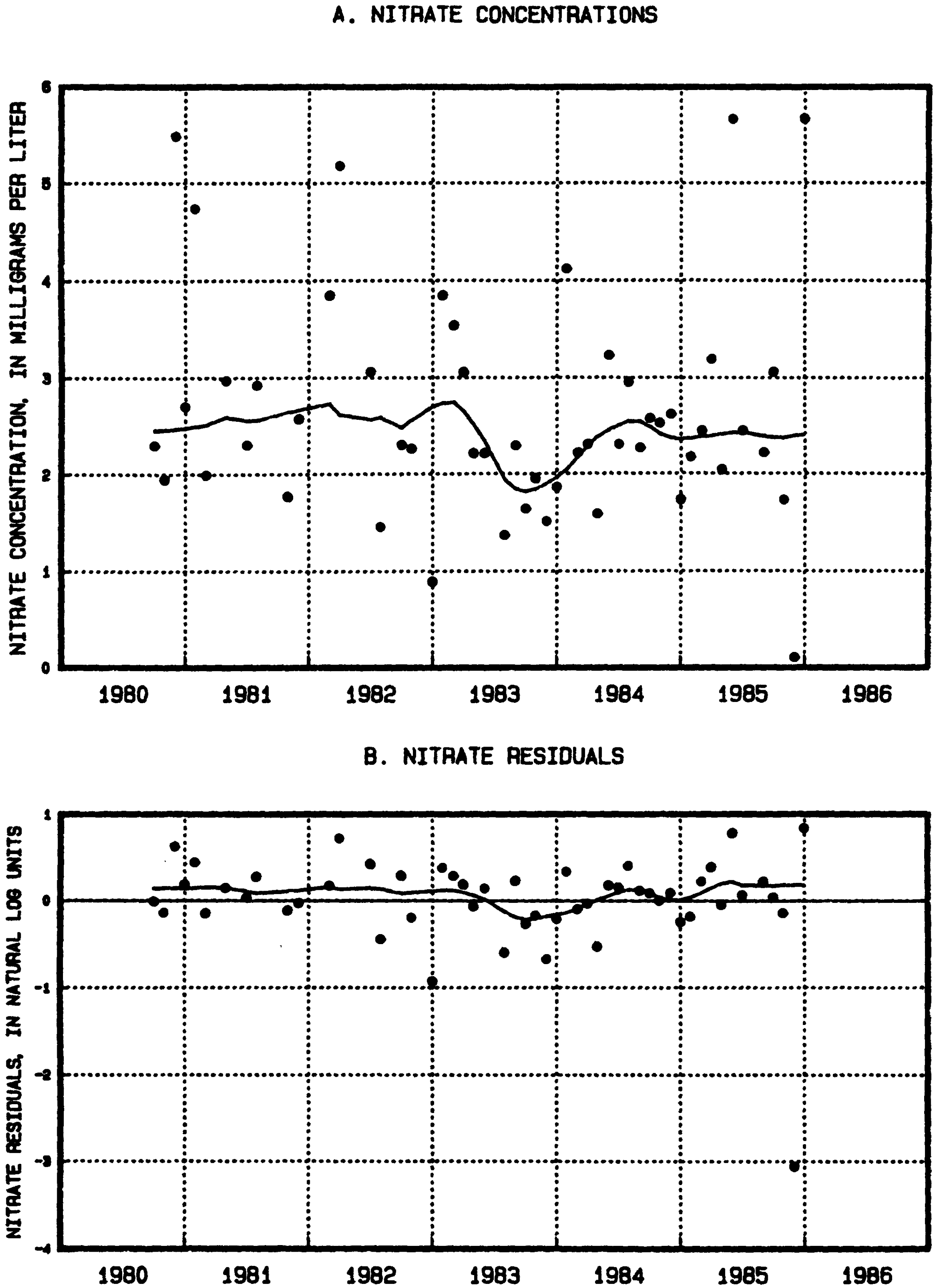
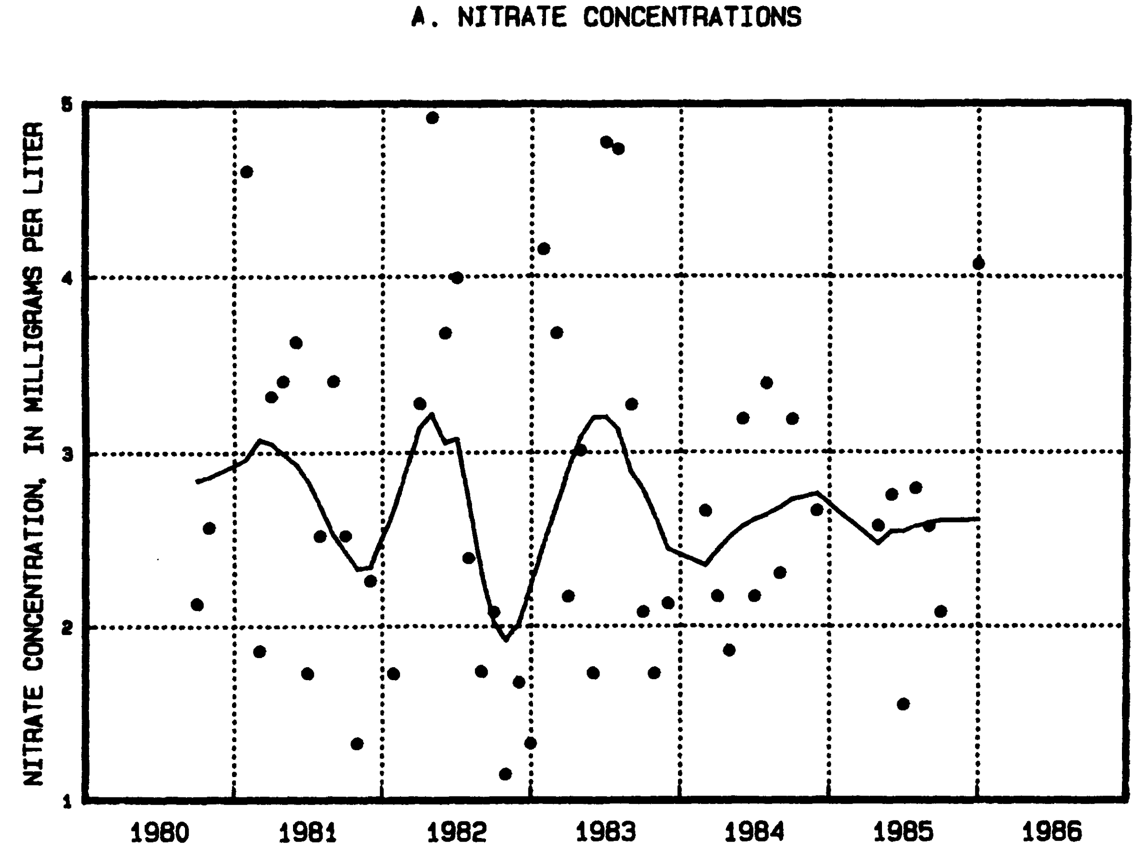


Figure 104.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for amount of precipitation, Waterloo, Ontario, site 184a.



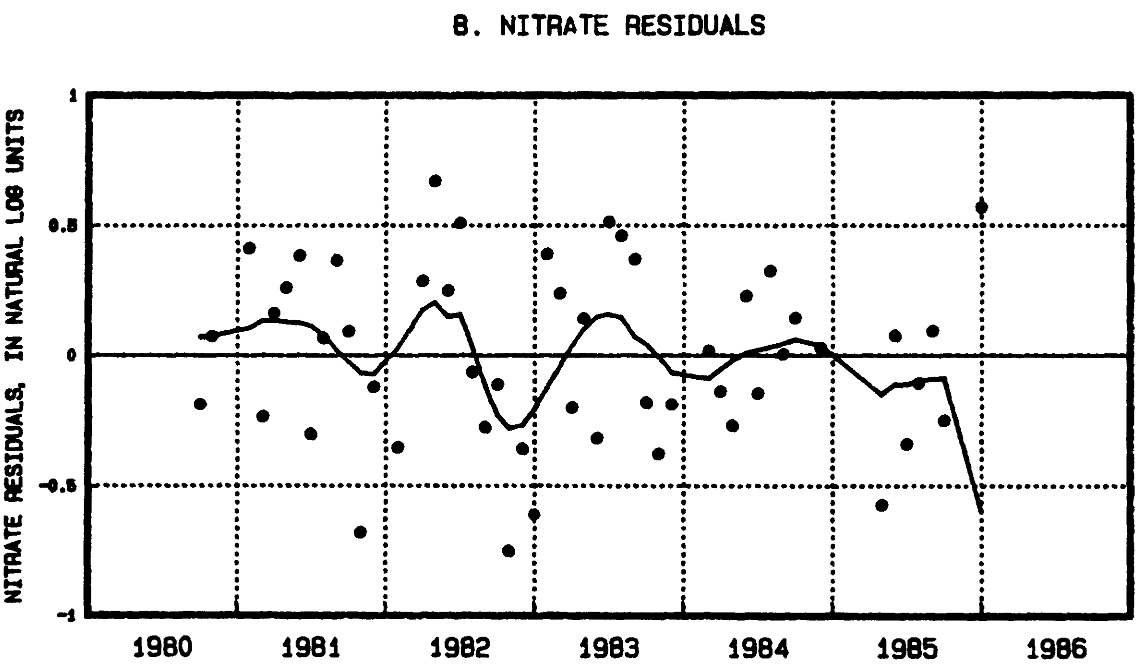


Figure 105.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for amount of precipitation, Uxbridge, Ontario, site 187a.

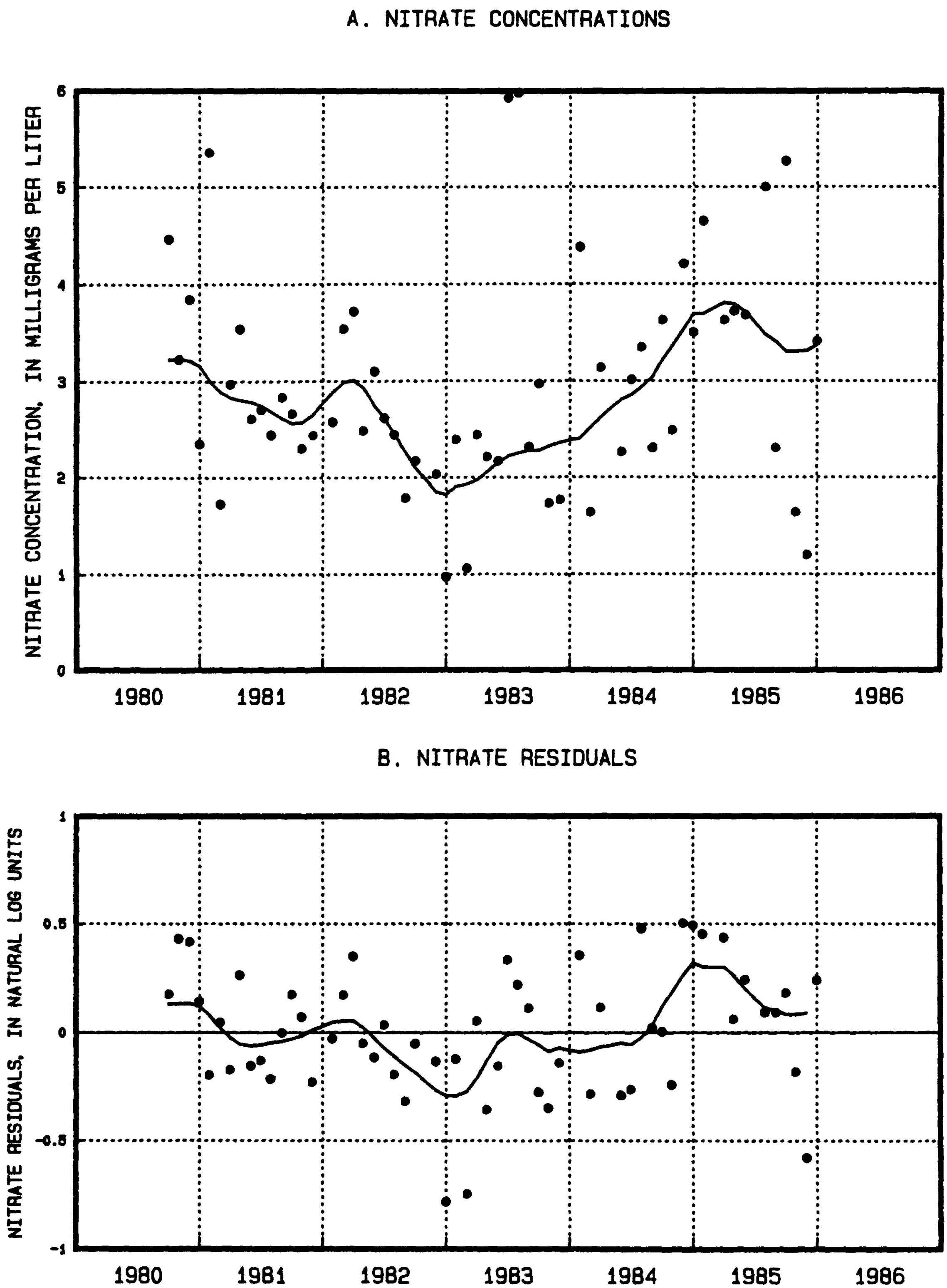


Figure 106.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for season and amount of precipitation, Campbellford, Ontario, site 189a.

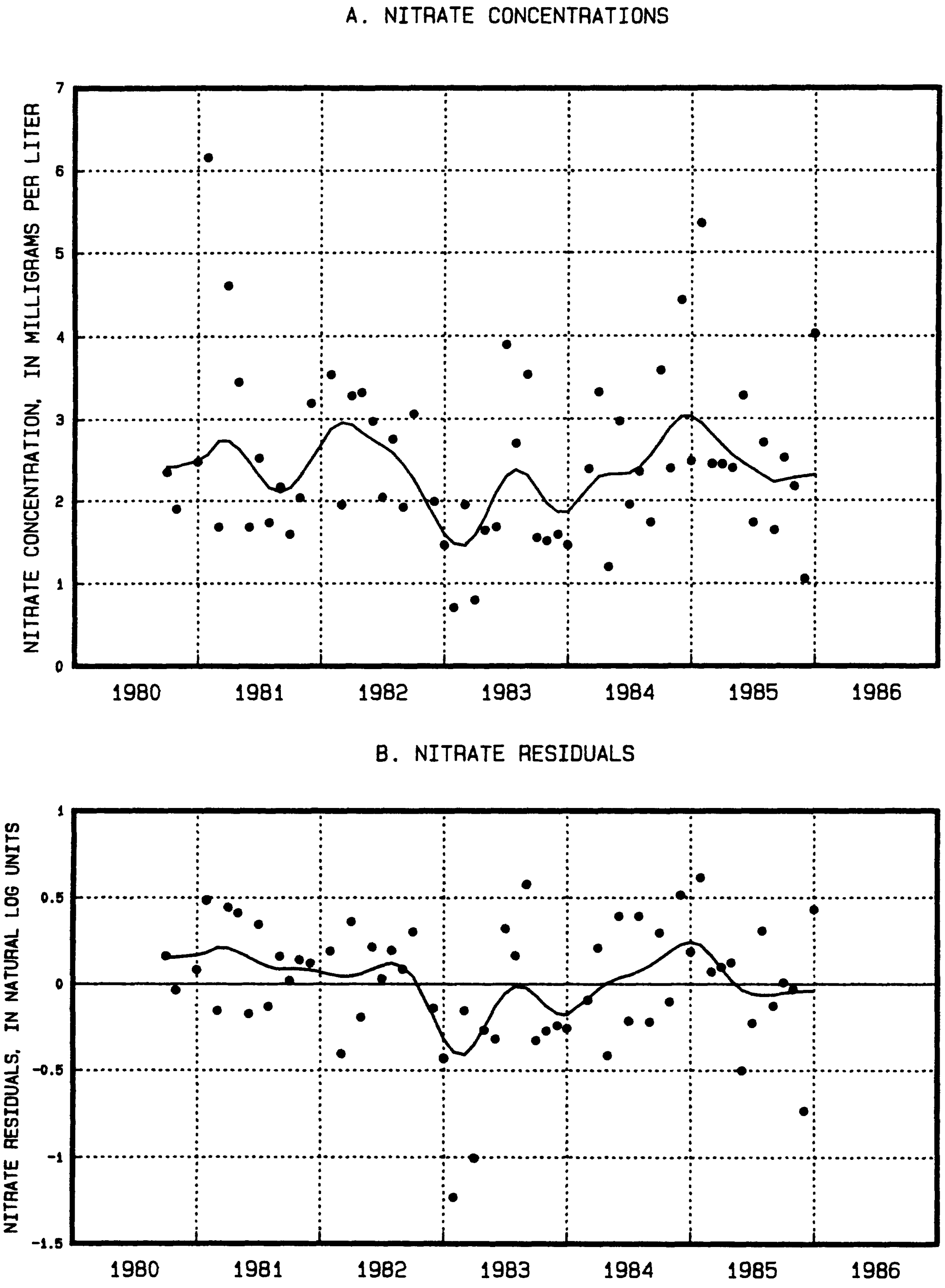


Figure 107.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for amount of precipitation, Smith's Falls, Ontario, site 192a.

A. NITRATE CONCENTRATIONS

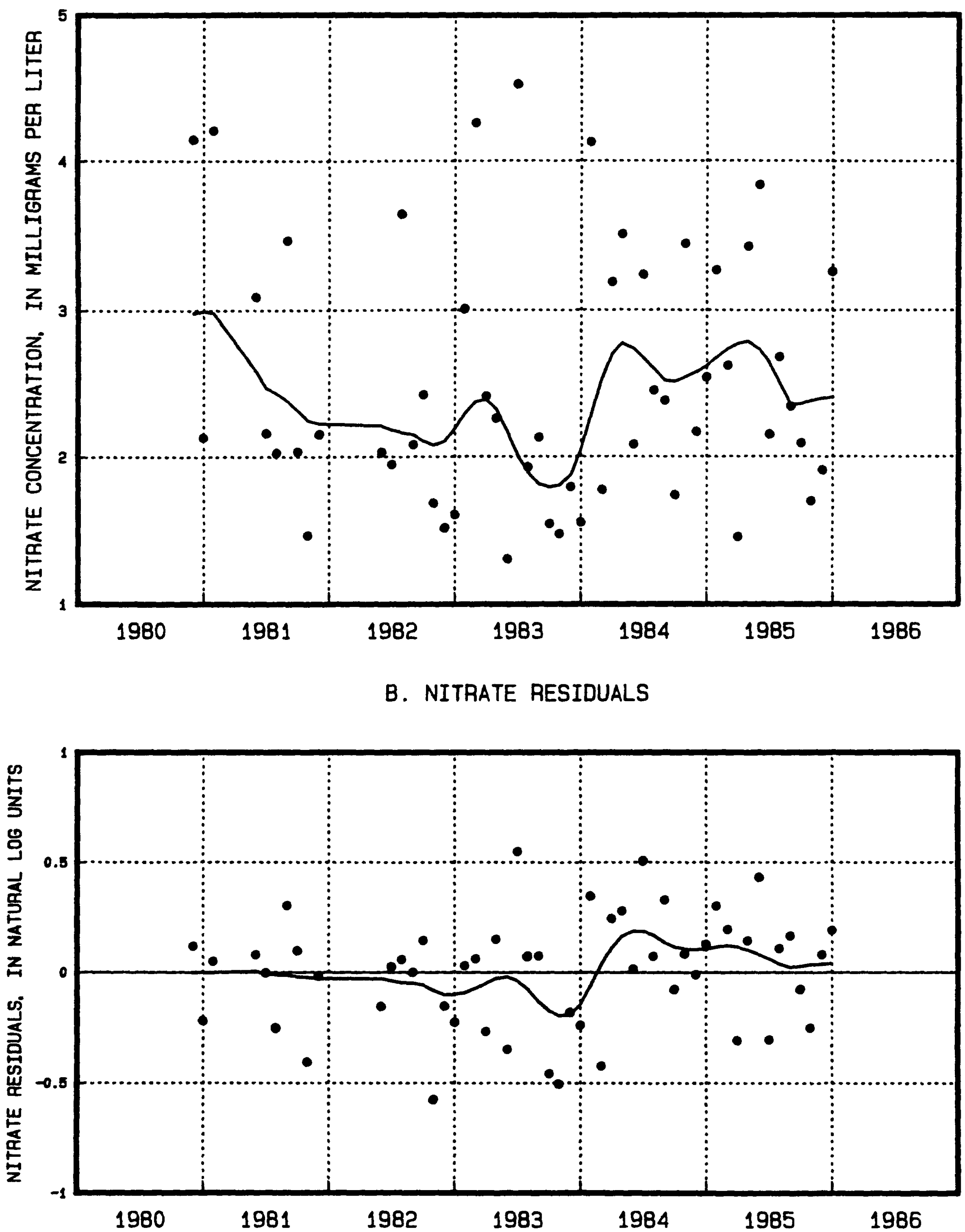


Figure 108.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for amount of precipitation, Melbourne, Ontario, site 221a.

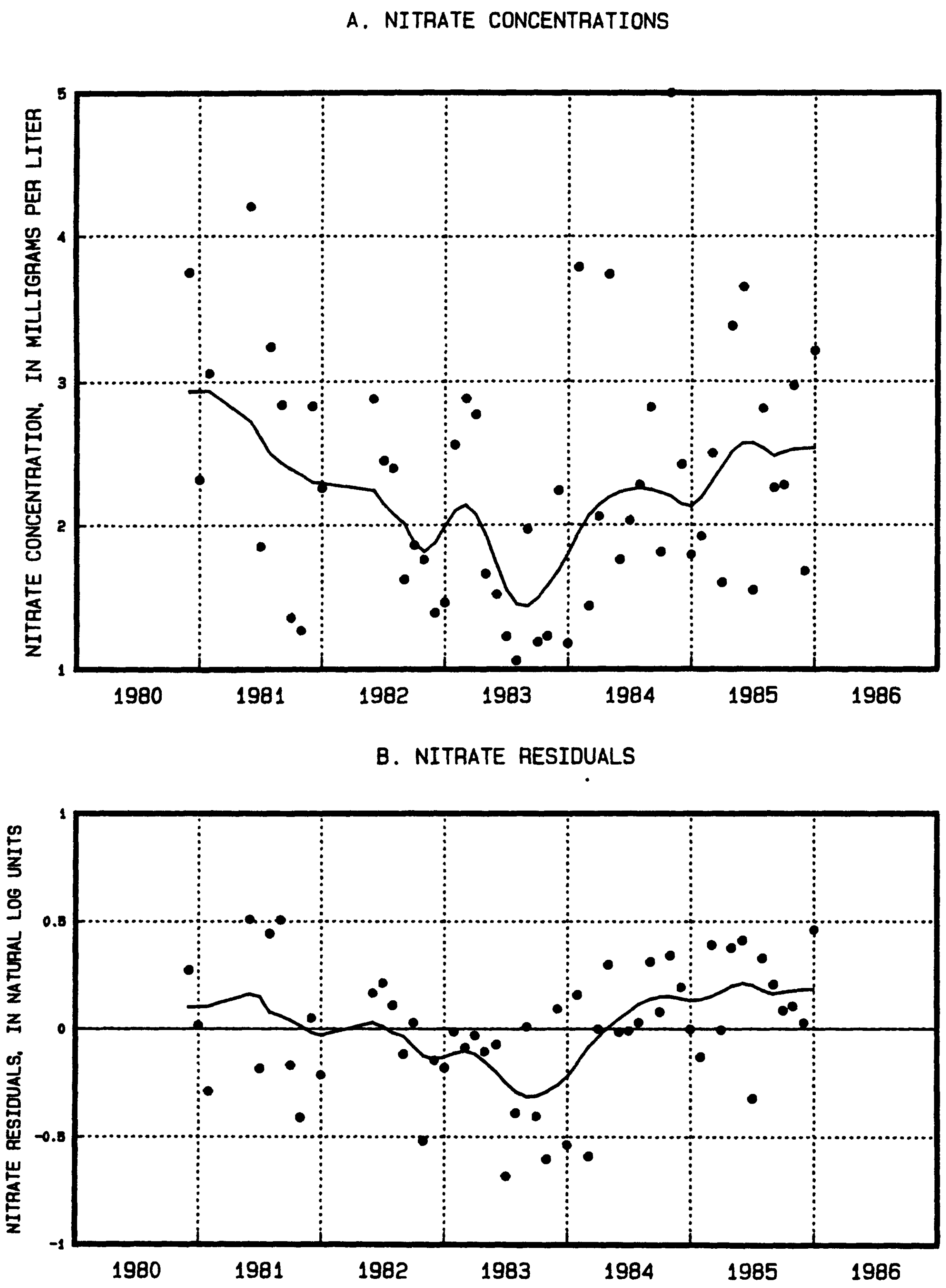
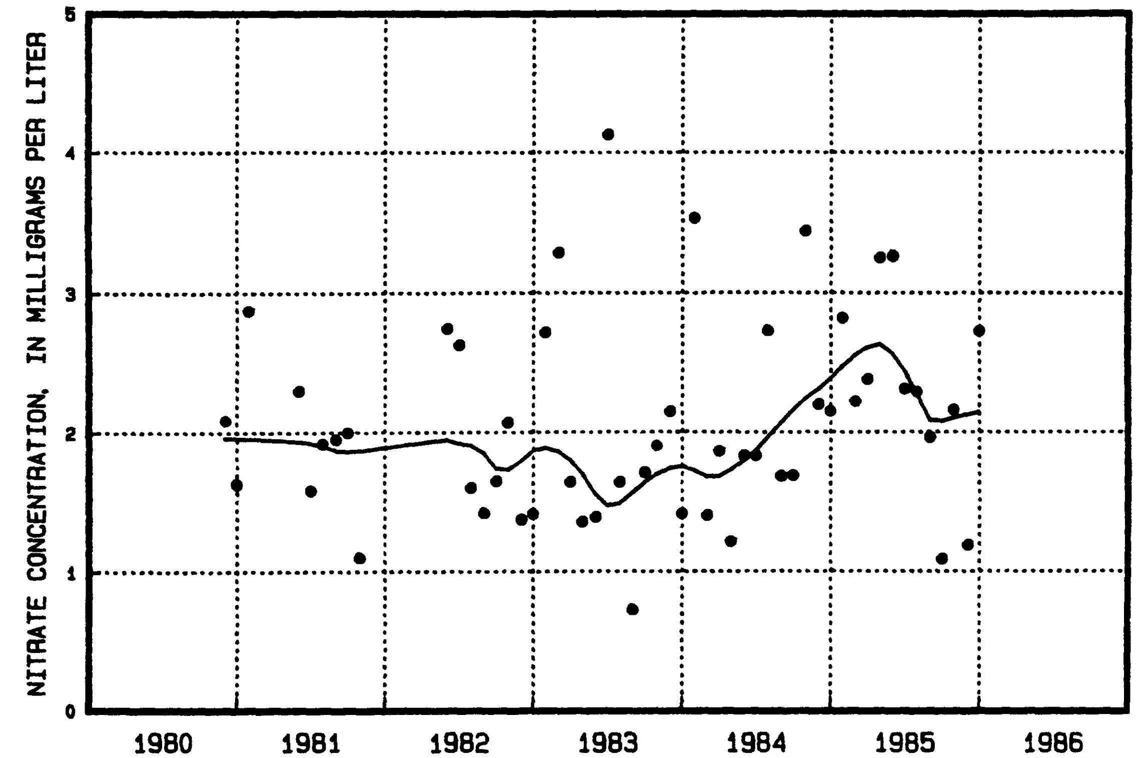


Figure 109.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for amount of precipitation, North Easthope, Ontario, site 222a.

A. NITRATE CONCENTRATIONS



B. NITRATE RESIDUALS

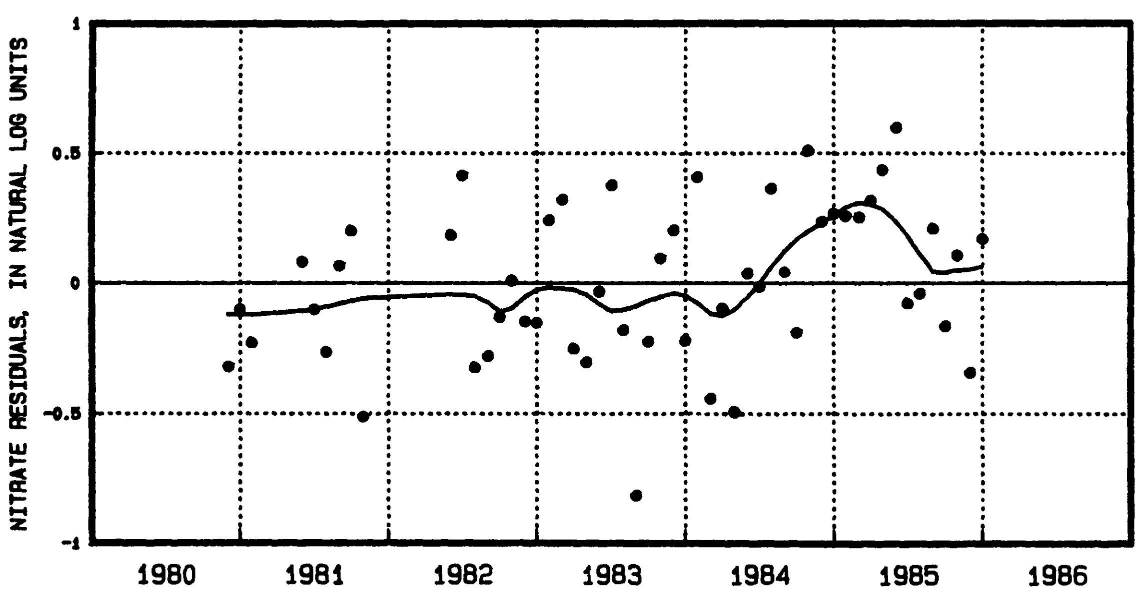


Figure 110.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for amount of precipitation, Balsam Lake, Ontario, site 225a.

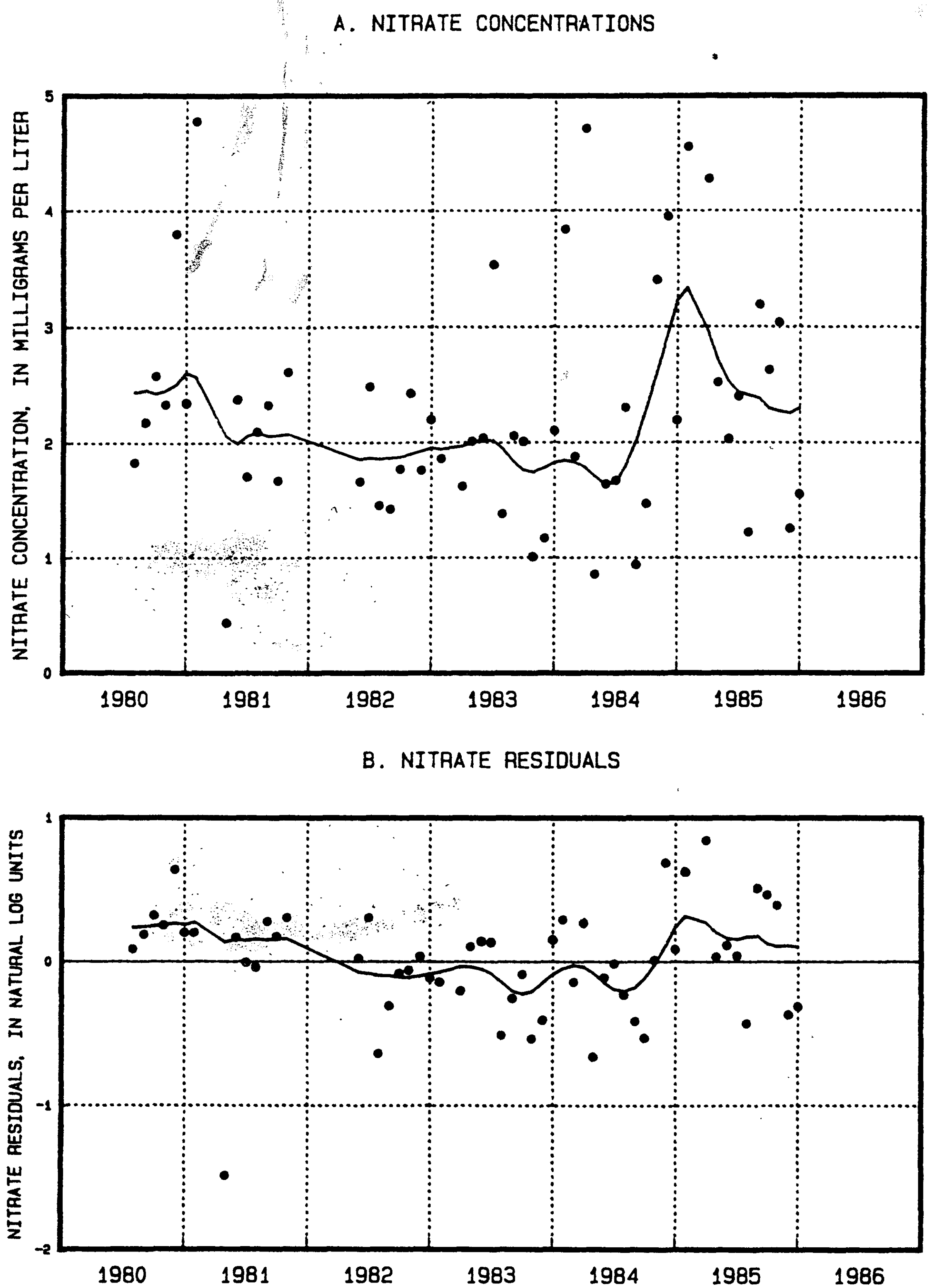


Figure 111.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for amount of precipitation, Railton, Ontario, site 228a.

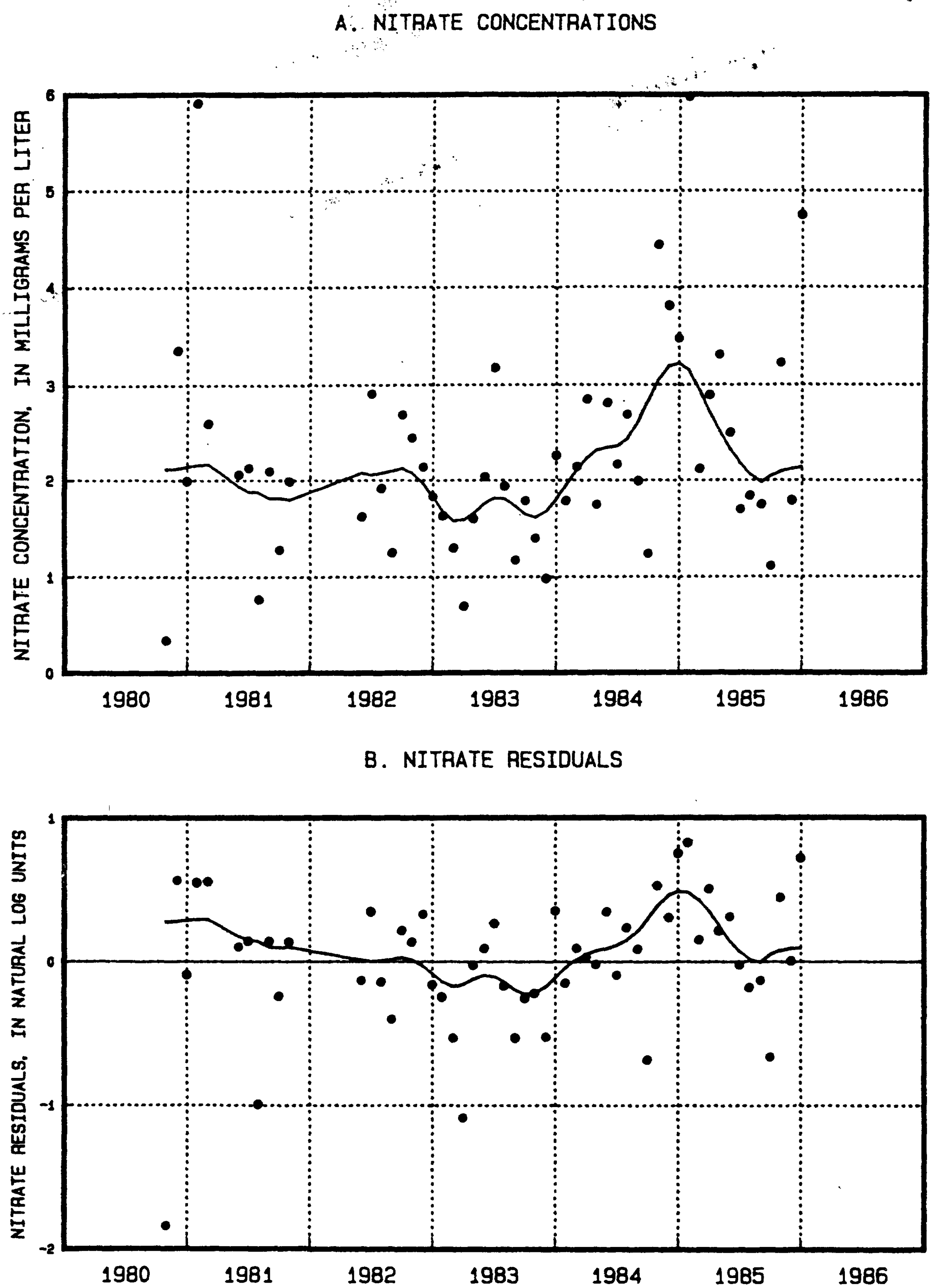


Figure 112.--Smoothed (A) nitrate concentrations and (B) nitrate residuals adjusted for amount of precipitation, Graham Lake, Ontario, site 229a.